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AMIGA Doctor Horgan's Complete Guide to Amiga Music And FX - Free with CU Amiga Magazine May 1996

FREE 96 PAGE AMIGA MUSIC GUIDE

Doctor Horgan's Complete Guide to

Amiga Music and FX

All you need to know about:

• Musical uses for your Amiga • The Amiga's internal audio • Perfect sampling • Sequencers & trackers • MIDI & recording extras • Amiga samplers • Creating sound effects & much, much more ...

Doctor Horgan's Complete Guide to

Amiga Music and FX

By Tony Horgan
Dedicated to Jo, Princess of Patience

Designed by Anthony Collins

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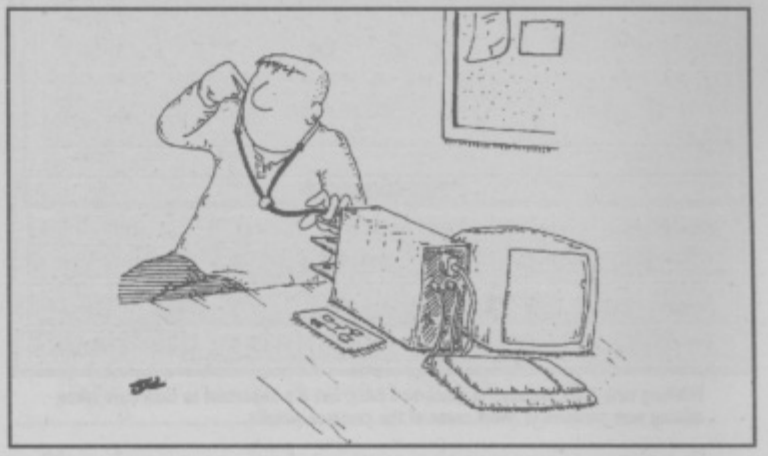
chapter 1

The Amiga's audio hardware and MIDI facilities

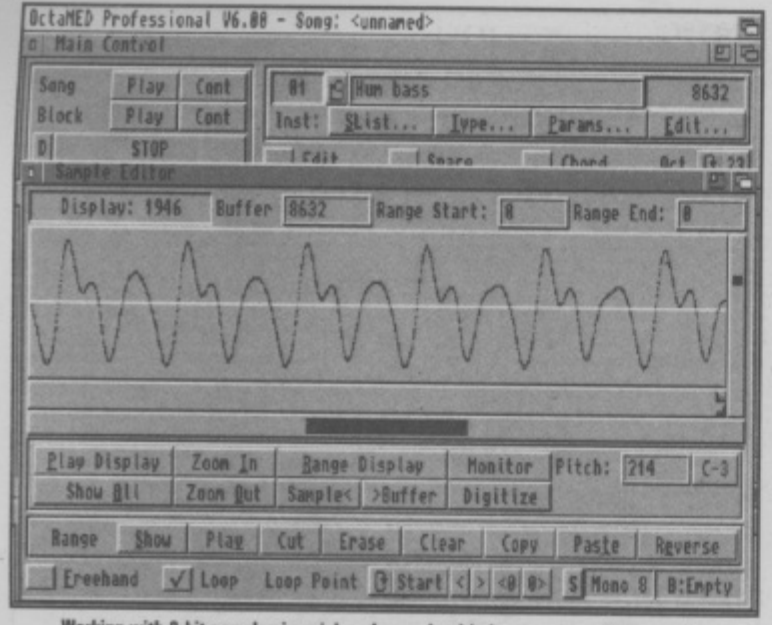


Meet Paula

Let me introduce you to Paula. Paula is the chip inside your Amiga that is responsible for every sound your Amiga makes. 'Paula' is not an acronym; all of the Amiga's custom chips were given names when they were originally developed, so if you were to look inside your Amiga you'd also find chips called Gary, Denise, Agnus and even the rather unflattering Fat Agnus. Paula deals with a few tasks, including the control of the disk drives, but its main job as far as we are concerned is to play sound and music.

8-bit architecture

Unlike the rest of the Amiga's architecture, Paula is an 8-bit chip. This means that the highest number it can move around in a single packet is 256 (much of

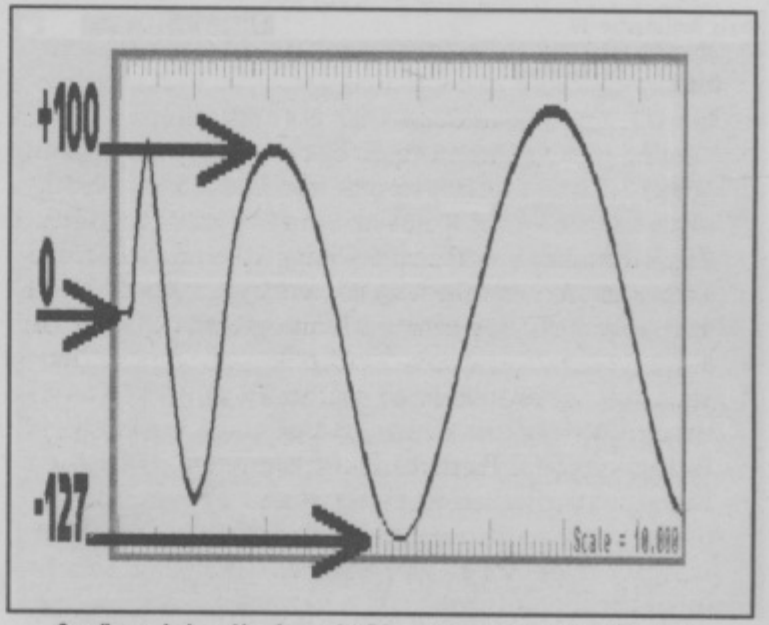

OctaMED Professional V6.00 - Song: <unnamed>
Main Control
Song Play Cont
Block Play Cont
STOP
01 Hum bass 8632
Inst: SList... Type... Params... Edit...
Sample Editor
Display: 1946 Buffer 8632 Range Start: 0 Range End: 0
Play Display Zoom In Range Display Monitor Pitch: 214 C-3
Show All Zoom Out Sample< >Buffer Digitize
Range Show Play Cut Erase Clear Copy Paste Reverse
Freehand Loop Loop Point Start Mono 8 B:Empty

Working with 8-bit samples is quick and easy, but it's important to take care when editing your samples to avoid some of the common pitfalls.

the components of the current Amiga range has 32 bit architecture, which means that the highest number these parts can deal with is 4,295 million). Why should we care about that? Because the 8 bit architecture directly relates to the maximum bandwidth of the sounds that Paula can output. Most modern digital musical instruments have 16-bit architecture or better. You would have to work quite hard to get bad sound quality with a 16-bit system, but with an 8-bit system the reverse is true. Higher bandwidth leads to higher fidelity of sound. Don't worry though, this doesn't mean you're stuck with useless technology! Far from it in fact. Many people make a living from producing music within the confines of 8 bits, but you do need to know what you're doing in order to get those professional results and that is what this book is for!

Sampled sound

The Amiga generally deals with sampled sounds. Although Paula can play sounds that have been synthesised (sound waves created by mathematical formulae), these tend to be rather unimpressive and cannot compete with even the most basic synthesiser keyboard. However, using sampled sounds, you can create absolutely any sound you like. Sampling is a term used to describe the process of making a digital recording of a sound. Using a sampler cartridge you can sample any sound and then replay it from your Amiga. During the sampling process, the sampler cartridge reads the incoming sound wave thousands of times every second. Each time it reads the wave it records a value between 0 and 255 (or -128 to +128) depending on the position of the wave at that precise moment. By recording a series of these 'snapshots' it builds up a digital picture of the

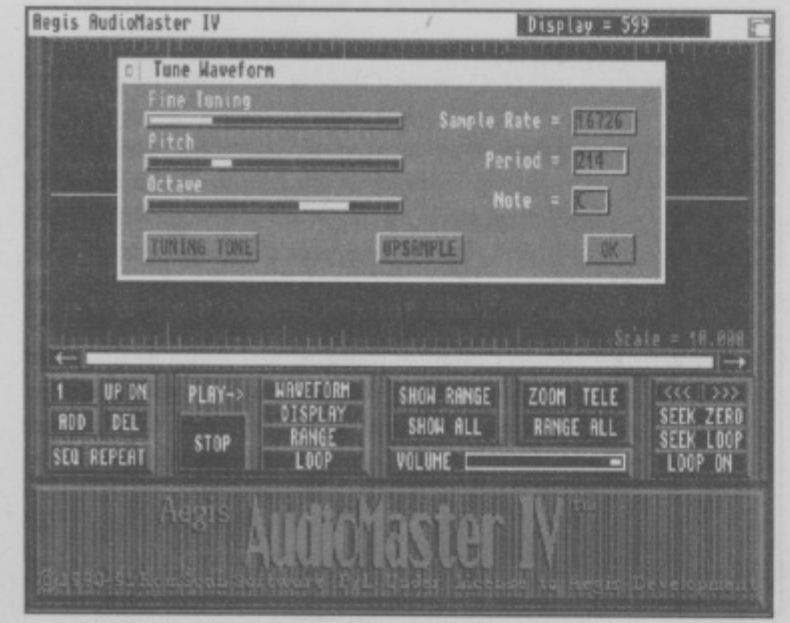


Sampling works by making thousands of tiny snapshots of a sound every second.

sound wave. The Amiga can then replay the sound by moving through each of these snapshots very quickly. This process gives the impression of a moving sound wave in the same way that a series of still frames of cinema film give the illusion of moving pictures. The ear is fooled into thinking that it can hear the original sound.

Sample rates

The rate at which these snapshots are taken has a direct effect on the quality of the sound recording (the sampled sound). If the rate at which the snapshots are taken is too low, the sample will not sound exactly the same as the original sound. To use the cinema film analogy once more, imagine if you were watching a film and the picture only changed once every second, instead of 30 times every second.



Choosing the right sample rate when recording a sound is essential. Higher rates lead to more acurate reproductions of the original sounds.

All the movement would look very jerky and the illusion would be ruined. The same is true of a sampled sound – in this case the result would be audible overtones created by the steps in the sound wave. Each step would make a slight clicking sound and together the effect of these clicks would be an unpleasant ringing tone, while certain parts of the original sound would simple not have been recorded, particularly the highest frequencies.

For this reason sample rates are very important when it comes to sound quality. Paula can replay sampled sounds at a maximum rate of 28kHz, which means 28,000 snapshots every second! These incredibly high rates are required to replay the higher frequencies that the human ear can detect. This also allows you to replay sounds at high pitches that were originally recorded at lower rates, which is essential for musical applications.

Four Channels

Four mono channels of sound can be played simultaneously. Alternatively you can play two stereo channels. In effect it's the same thing. All of the sound from Paula is passed through the two RCA phono sockets at the back of your Amiga. If you are using four mono tracks (as is the case with most music packages) then two of the tracks will be output to one of the RCA phono sockets, and the other two will be passed to the remaining phono socket. In this case if you were to connect these audio outputs to a hi-fi (using an AUX or CD input on the rear of the hi-fi for instance) you would then hear two of the channels through the left speaker and the other two from the right speaker.

Trackers work with four channels of mono samples, while MIDI-orientated seqeuncers that have Amiga sample facilities often work with mono sam-

ples but choose the output channel at random. The more refined sequencers allow you to specify the output channel for a sample. For musical purposes it's normally best to work with mono samples as this allows you to play four sounds at once (eg. bass, drums, melody and vocals). If you are using stereo samples you are limited to playing just two at once. This is because a stereo sample is actually two mono samples (one for the left and one for the right), so by playing two stereo samples you are using up all four output channels. Stereo samples are most often used in multimedia type applications where samples may be replayed one at a time. For example, VideoStage Pro (which came free with the March 1996 issue of CU Amiga Magazine) can load and play stereo samples within presentations. Most sampler cartridges offer stereo sampling, and their accompanying software will often have facilities to replay a series of stereo samples in the form of a playlist. AudioMaster IV (free with the November 1995 issue of CU Amiga Magazine) has advanced stereo replay facilities which even allow you to create sequences from a single sample by setting up various loop points. Using this, with enough memory you could sample an entire song and completely remix it by rearranging sections and loops.

Chip RAM

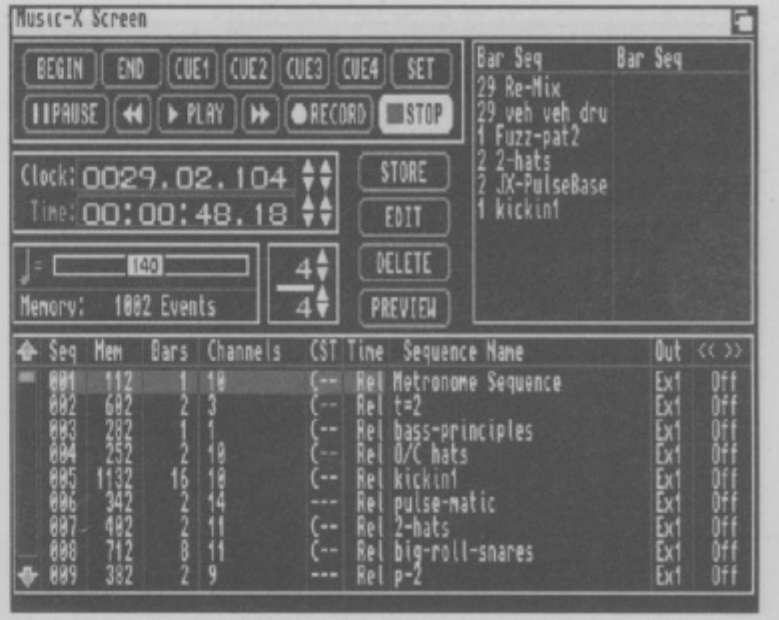
Your Amiga has two types of memory: Chip RAM and Fast RAM. Chip RAM has a very special relationship with Paula, as it does with all the Amiga's custom chips. As standard, Paula can only play samples that are stored in Chip RAM, although now many samplers and trackers can play samples from Fast RAM. Chip RAM is sometimes called Graphics Memory because it's also the memory that is used to display graphics. Old 1.3 Amiga 500s have 0.5Mb

of Chip RAM, while the A500 Plus and A600 both have 1Mb of Chip RAM. The A1200 and A4000 both come with 2Mb of Chip RAM. Most RAM expansions will add to the total Fast RAM of the Amiga but not affect the Chip RAM capacity.

However, there are Chip RAM upgrades available, such as the MegaChip RAM (£159) from Power Computing which upgrades an A500 or A2000 to 2Mb of Chip RAM. Other Amigas can also be upgraded in a similar fashion with a replacement Agnus chip (£29) also available from Power Computing. Chip RAM limitations are becoming less of a problem as programmers develop ways to play samples from Fast RAM.

Amiga MIDI

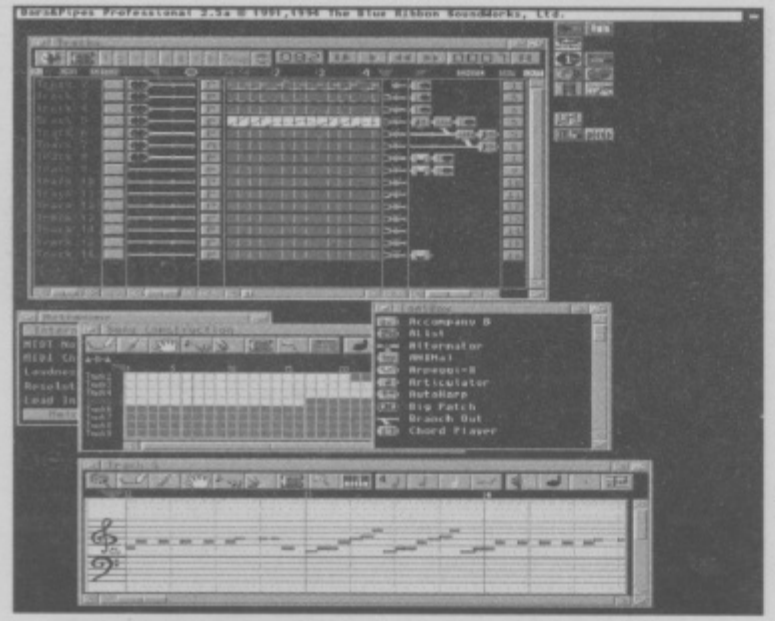
The other side of Amiga music is MIDI sequencing.



One of the most popular MIDI sequencers on the Amiga is also one of the oldest. Music X looks plain but has a powerful simplicity which makes it very immediate.

MIDI sequencing is the term used to describe a computer (or other device) remotely controlling any number of electronic musical instruments so that they produce music. This is a totally separate area from Amiga sampling, but the two can work together very neatly. MIDI stands for Musical Instrument Digital Interface and is a standard form of communication used by all modern electronic musical instruments.

MIDI instruments 'talk' to each other via standard MIDI cables. These do not carry audio signals but are data lines. MIDI cables have a five pin 'din' plug at each end, but there are no such connectors on the Amiga. However, all you need is a MIDI interface plugged into the Amiga's serial port to be able to connect directly to any MIDI instrument. MIDI instruments include drum machines, keyboards synthesisers, synthesiser modules, effects



Bars and Pipes is a MIDI sequencer which takes your Amiga past the normal aspirations of a few keyboards. Give it a chance and Bars and Pipes will take over the world!

processors, outboard samplers and even mixers (which can be programmed to have their faders move up and down at the appropriate point in a track).

A typical basic MIDI set-up might consist of an Amiga connected to a synthesiser keyboard via a MIDI interface and a couple of MIDI leads (MIDI leads have a one-way flow of information, so one is needed to carry information to the keyboard from the computer, while another is needed to take information back from the keyboard to the computer). The Amiga would be running some MIDI sequencing software. This software would be able to record any music that was played on the keyboard. However, as the lead is a data link, the computer would only record whatever notes were played, for how long, how hard they were hit and so on. No audio recording is made. For example, the messages travelling down the MIDI cable from the keyboard to the computer (if translated into English) could be something like "C-2, played softly for half a second, notes C-3 F-3 and A-4 all played at once for two seconds...". When the computer had finished recording, the music could be played back by sending that same information back along the MIDI cable to the keyboard, which would then play the notes as it was told to do so by the computer.

From within the sequencer software running on the Amiga you could examine and rearrange the notes, correcting any mistakes you might have made in the timing for example. Sequencers all come with an optional 'quantise' function, which will automatically correct the timing of all the notes according to its own internal metronome. Recording the order of the notes and so on rather than the actual sound has many advantages. For example, you can record each track separately (drums first,

bassline next, then chords and melody etc) and if you're not happy about one particular part you can always change or delete it without affecting the rest of the arrangement. It also gives you the benefits of a multi-track tape recorder without the expense. You can do all the mixing from within the mixer, setting the relative volumes of each track and so on, recording the whole thing to a single stereo tape or DAT recorder.

As you'll see in the Sequencers and Trackers section of this book, it's quite possible to combine Amiga samples and MIDI sequencing. In fact this is the best option if you really want to use your Amiga's full musical potential.

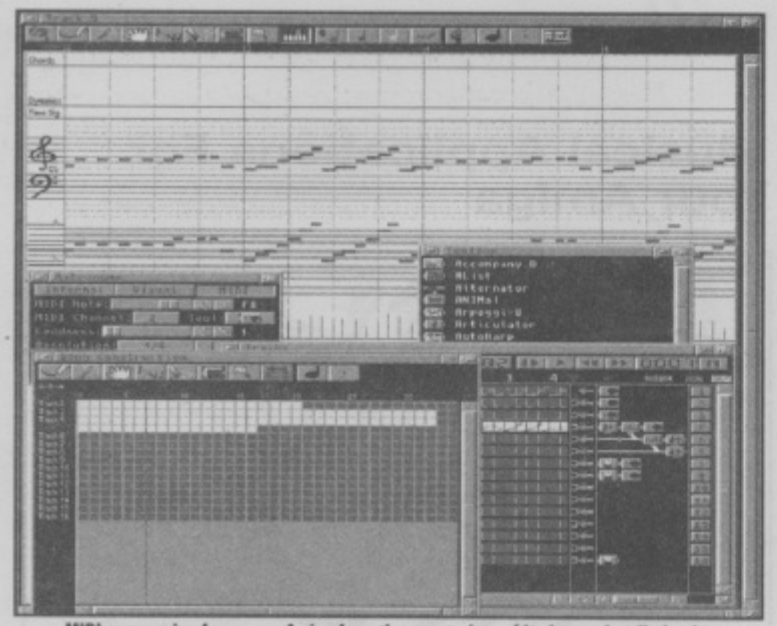
chapter 2

Musical Applications For Your Amiga

The obvious role for your Amiga to fill in a musical situation is that of a sequencer, playing music using either internal samples, MIDI instruments or a combination of both. However, there are plenty of other uses to which you can put your Amiga in the studio. This chapter will highlight some of the many and varied ways that your Amiga can lend a hand in the music production process.

Sequencer

As the subject of sequencers and trackers is explored quite thoroughly in Chapter 3 we won't go into too much detail here. Running a tracker or sequencer program on your Amiga gives it the power to control almost the entire music production process, from sampling sounds 'on the fly' to composing and even performing an automated mix-



MIDI sequencing frees your Amiga from the constraints of its internal audio hardware. With a sequencer you can control an entire studio from your favourite computer.

down to your recorder. In this case, the Amiga is the master of the studio, while the rest of the equipment are slaves.

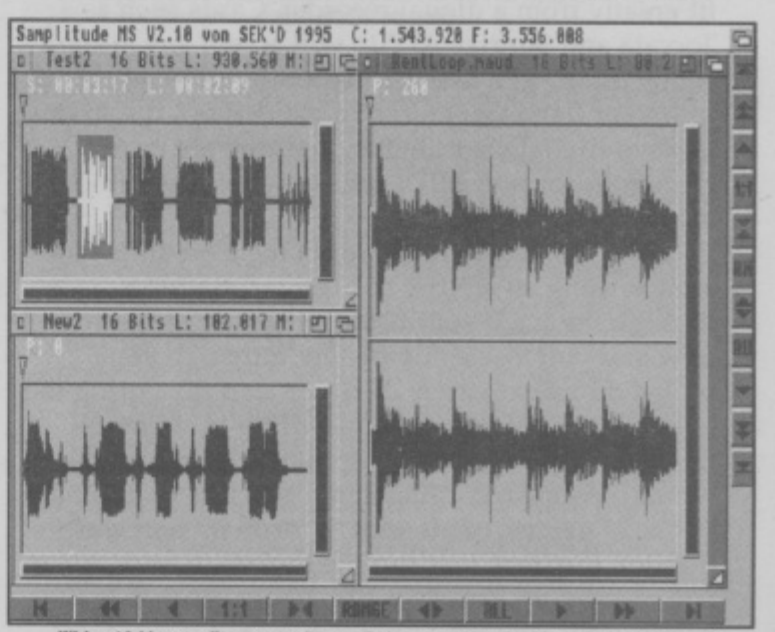
Digital mastering

Digital audio recording has revolutionised music production over the last few years. Until recently if you wanted to make a high fidelity master recording of a piece of music, the chances are you would have to hire an expensive studio with a professional reel to reel tape recorder, with the additional cost of hiring an engineer to push all the right buttons. These days almost everything is recorded digitally. Now that CD is firmly established as the international standard for commercial music distribution there's even more reason to go straight to digital at the mastering stage.

Your Amiga has the potential to act as a professional quality digital recorder, making recordings

that match the standard of DAT and CD. CDs are recorded digitally at 44.1kHz with 16-bit resolution. By adding a Toccata or Sunrize AD516 card to your Amiga it can record sound straight to a hard drive at exactly the same rates. This is a major feat, as it means that in a perfect scenario, you can make one master recording from your own home studio and transfer that in a straight digital to digital copy onto a CD. This means you get the cleanest possible recording, as there is only one point at which unwanted noise and distortion can degrade the recording: the point at which the music is mixed and fed into the recorder.

The elmination of noise and distortion is not the only advantage of using the Amiga as a digital recorder. Once you have the music on your hard drive you are then free to make any edits you like. The music will have been saved as one very large



With a 16-bit recording system in your Amiga you can make CD quality recordings of your music straight onto your hard drive.

sample, and this can be loaded into memory where it can be cut, pasted, cleaned up and passed through all manner of effects using specialised software. For example, if you had originally recorded a ten minute epic but radio stations wanted a shorter version for airplay, copying the recording and snipping out bits here and there would be a very simple task. As the second copy you were editing was made in a straight digital to digital process there would be no loss of sound quality as there would be if you had to copy an original tape recording to another tape for manual splicing. In fact you could make as many copies of the original as you needed, editing each for a specific audience (album version, radio friendly edit, dance mix etc.).

Acoustic recording

Even an entirely acoustic musical set-up would benfit greatly from a digital recorder. Cards such as Toccata and Sunrize AD516 will accept any audio signal input, so it doesn't matter if you're recording techno or flamenco guitar. In many ways the advantages of digital recording and editing are more numerous for non-MIDI setups, where instruments are recorded live.

Let's say you were overdubbing a bassline onto a track using an electric bass guitar. Halfway through the track your timing goes out of the window and you lose it completely, although you pulled off an extremely dextrous slap riff during the intro passage. If you were recording to analogue tape you would have two options: either start the whole bassline recording again and lose that initial stroke of genius, or attempt to 'drop in' half way through the track and resume recording from where you messed up, which can be tricky. Neither is a particularly attractive proposition, but if you were recording to a hard drive you could carry on

Even if your music is totally acoustic you can still use your Amiga as an advanced digital recording system instead of noisy old tape.

regardless even if your timing went astray during the middle section. Once you'd got to the end of the track you could fix the mistake by either manually cutting and moving the notes into time, or by copying a couple of bars of good bass from another part of the track and replacing the bad parts with this. You could even take that little slapped bass riff from the start and have a go at dropping it into other parts of the track as a little fill, or maybe loop it to make an interesting 'middle eight' section.

A huge weight is lifted from your shoulders when you know you have the ability to edit your recordings in this way. Now, instead of getting your head down and gritting your teeth until the end of the track to make sure no mistakes are made, you are free to relax and enjoy the whole thing, assured by the knowledge that any imperfections or mistakes can be fixed. It also offers plenty of opportunity to skip the more mundane parts of the job of

recording and let the creative juices flow.

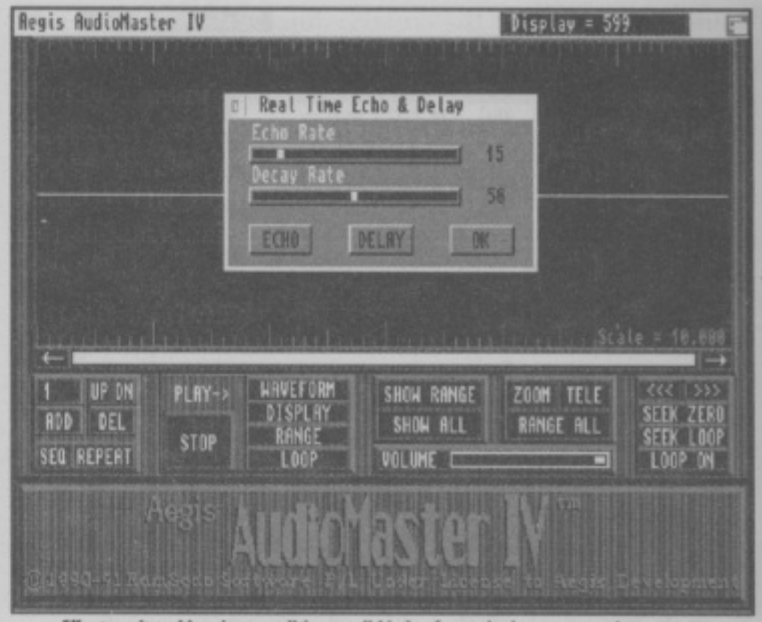
MIDI Sampler

Maybe you already have another computer or a dedicated hardware sequencer controlling all of the instruments in your studio. The Amiga's sampling and sample replay facilities can still be exploited by getting it to act as a sample replay unit, triggered via MIDI from your sequencer or a MIDI keyboard. This will allow you to play up to four samples at once. Technosound Turbo II Pro from New Dimensions has options designed to do this. There are a number of situations in which this could be used. If your equipment is being sequenced from a computer, whether it's an Amiga, Mac or PC, an additional Amiga acting as a MIDI-triggered sampler will fit into the system with no problems.

It's worth remembering that even the oldest A500 has exactly the same sound chip as the A1200. You can pick up a second hand A500 for next to nothing, and if you need an extra sample replay unit this is well worth considering. Live musicians could fire samples from an Amiga using a MIDI keyboard, although the prospect of lugging around an Amiga and monitor for the sake of four samples won't appeal to many, especially now that there are quite a few portable MIDI samplers available.

Realtime effects

In any musical setup, effects processors come in very handy. Effects processing is used extensively in professional recording studios, to the extent that many musicians and producers feel completely naked without them! While many sounds and instruments are fine just as they are, certain effects can drastically improve a variety of sounds. Reverb (short for reverberation) is often over used but gives a sound an ambience as if it was being heard in a

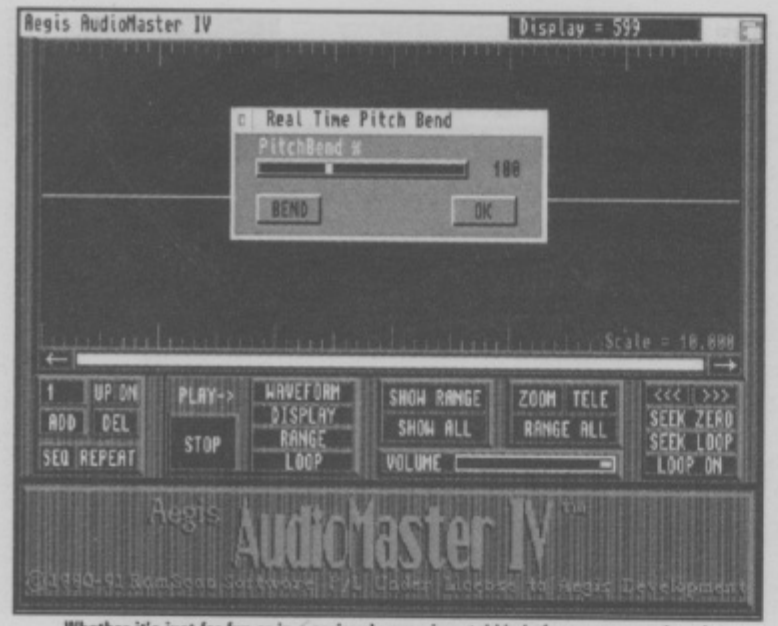


Effects units add various qualities to all kinds of sounds, but you can also use your Amiga to do the job. Echo and phaser effects are common in most sampler packages.

large hall or a church. This is especially useful for vocals and melodies. Either of these can sound rather harsh without any effects and adding reverb to them can also help mask minor imperfections.

The Amiga can be made to act as an effects processor using one of a number of samplers. Almost all sampler cartridges come with software that has some form of realtime effects option.

The best of the bunch is HiSoft's Aura. Aura is a combination of a 12-bit sampler cartridge that plugs into an A600 or A1200 via the PCMCIA slot, and some clever software. The Aura software has unique realtime sound processing routines, which as well as offering 12-bit input and output with internal 24-bit bandwidth for excellent sound quality, also is the only software available that offers combination effects. For example, you could process a sound with both reverb and phaser effects simultaneously. The range of effects processes is very

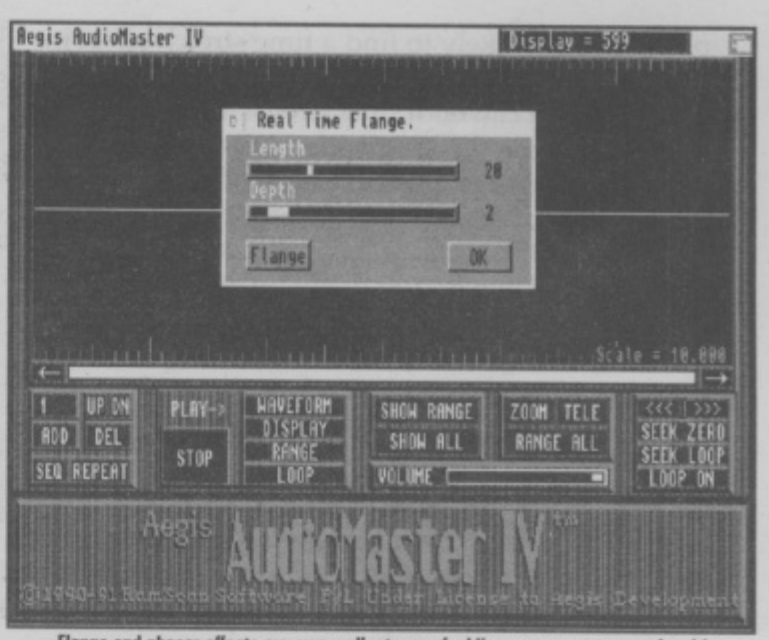


Whether it's just for fun or in a seriously experimental kind of way you can alter the pitch of your voice or any other sound in realtime with AudioMaster IV.

impressive and the results are a lot cleaner than you would get from 8-bit alternatives.

AudioMaster IV (as cover mounted on the November 1995 issue of CU Amiga Magazine) has a few good realtime echo and reverb effects, although like all of the 8-bit samplers, the reverb routines are rather crude extensions of the echo routines. There's more to creating a convincing reverb sound than repeating the original at lower volumes. For 8-bit use, HiSoft's AMAS is the only package that has a realistic reverb effect. Technosound Turbo II Pro has a mass of realtime effects, many of which are noisy but fun all the same, such as the pitch-changers and arpeggiators. HiSoft's MegaloSound has some realtime effects built in and also comes with a bonus program called The Realtime Effects Generator (TREG for short).

TREG was included on a cover disk with the October 1994 issue of CU Amiga Magazine. It's a



Flange and phaser effects are an excellent way of adding movement to sounds with a lot of treble content, such as drums and cymbals.

small program that is completely devoted to realtime sound processing. Along with robot and dalek processes, it also has a good range of echoes and delays. One of the most useful is the longest delay, which feeds the echo back into itself to create almost endless trailing mutating sounds from a single noise – perfect for abstract ambience.

Unwanted noise is always a problem when using anything less than 24 bits for effects processing, especially when subtle reverb and echo effects are employed.

The Amiga's low-pass filter can be switched on to clean up these effects.

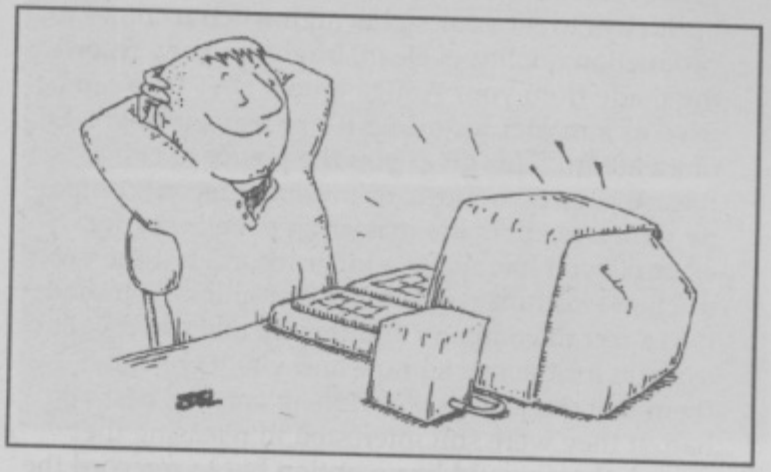
If you find you don't have the right process available from your realtime effects menu, one way around the problem is to sample the sound you want to process and affect it using the non-realtime effects. Most sample editors will have alternative effects available for processing samples. For exam-

ple, you are unlikely to find a time stretch effect in any realtime processor, but AudioMaster IV and Aural Illusion can both time stretch a pre-recorded sample. You can then incorporate your affected sample into your sequence during playback.

If you want to use an Amiga for realtime effects processing whilst sequencing from an Amiga you will need to Amigas. You won't be able to do both from the same Amiga because the audio channels will be in use by one application, locking out the other.

chapter 3

Perfect sampling



Anyone who's serious about making music with their Amiga needs to know a thing or two about sampling. The Amiga's four channels of 8-bit audio are capable of producing stunning sounds that are far superior to the results many would think are possible from 8-bits. The reasons that 8-bit audio has got itself a bad name are twofold: first of all it's easier for the beginner to make bad sounding 8-bit samples than good ones, and secondly the rest of the world has been working with 16-bit sound as a minimum base for years now.

The off-hand attitude often expressed towards 8-bit sound systems is not unfounded. Frankly it takes quite a lot of experimentation, practice and experience to squeeze 'professional quality' samples from an Amiga, which is why we've devoted a major section of this book to exactly that cause. If the main outlet for your Amiga tunes is going to be demos, modules collections, games and so on, then refining

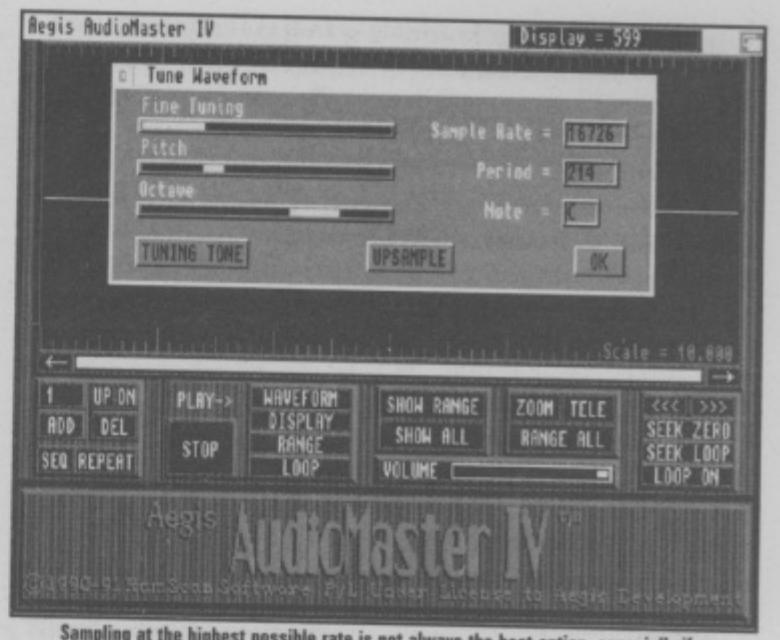
your sampling technique isn't vital but it will certainly help. If on the other hand, you aspire to creating music for commercial release, whether on CD, cassette or vinyl, the final sound quality of your productions is crucial.

It pays to set your sights high when it comes to production quality. A clean, bright, punchy recording made from your Amiga onto a DAT tape can be used as a master recording for pressing a single, EP or an album. This gives you the power to either release your own music or present a record company with a ready made master tape. Let's say for example you had made a killer record, but the production was fuzzy and lacked definition. You send it to a record company and they're interested – they ask you for the master tape and you have to tell them that the tape you sent them was the best you had. If they were still interested in releasing the record, there would be no option but to rerecord the song in a professional studio, which would almost certainly not be equipped with an Amiga and your specific tracker software, so you would have to try to reconstruct the record on an unfamiliar system, reprogram all those twiddly bits and maybe lose the whole vibe of the track. You might also have the bill for the studio time deducted from your royalties or advance from the record sales. Gutted eh? So get your production right from the start, beginning with perfect samples.

Sampling rates

The biggest factor governing the overall quality of a sample is the rate at which it was recorded. This is known as the sample rate. An explanation of how sampling works can be found in Chapter One.

Depending on what sound you are sampling and how you intend to use it, the best sample rate will vary. If you are low on Chip RAM or you have



Sampling at the highest possible rate is not always the best option, especially if you want to use your samples in a tracker or sequencer.

other memory limitations you will want to use the minimum sample rate you can get away with. This will use as little memory as possible. If you use too low a sample rate, the upper frequencies of the original sound will not be captured. Instead you will get a poor substitute which sounds hard and scratchy. However, let's assume you have a generous amount of Chip RAM to play with (2Mb is standard on the A1200). Unless you are using lots of very long samples (a series of two or four bar loops for example) this should give you enough sample memory for most projects.

If you do not intend to retune your samples then by all means use the highest rate you can. However, just because you have a lot of memory spare, it's not necessarily best to sample at the highest possible rates all the time. Trackers work by replaying sampled notes at different speeds, which changes their pitch. Generally the highest sample rate a

tracker can replay is 28kHz – this is the rate it used when you play the note A-3 (note A on the third octave). If you sampled a single note of an instrument at 28kHz, when you loaded it into a tracker you would not be able to play that note any higher than the original pitch, so in the case of sampling single instrument notes you need to sample at a lower rate so that it can then be pitched both up and down from within the tracker.

C-3 is the note in a tracker that corresponds to a sample rate of 16kHz. This is a good rate for sampling most instrument notes. If you're using a tracker and you want the notes on the display to match the notes that are playing, make sure that the notes you sample match their appropriate sample rate. If you can tell the pitch of the original note you are sampling, compare it to the following chart to pick a suitable sample rate.

Suggested rates

The following list suggests minimum sample rates for a variety of sounds. The trade-off between sample rate, sound quality and memory use is open to variation depending on your requirements, but these figures have been reached on the basis that you do not have limitless memory but high fidelity is a priority. As they do not need to be retuned, the rates suggested for drum loops and one-shot sounds like drum samples can be increased to the highest your memory will allow with an according increase in reproduction quality. The scientific method for finding the minimum sample rate is to calculate the 'NyQuist rate'. This is twice the frequency of the highest pitch in your original sound. The easy method is to use this list.

Note	Period	Hz	Note	Period	Hz	Note	Period	Hz
C-1	856	4181	C-2	428	8363	C-3	214	16726
C#1	808	4430	C#2	404	8860	C#3	202	17720
D-1	760	4709	D-2	380	9419	D-3	190	18839
D#1	720	4971	D#2	360	9943	D#3	180	19886
E-1	680	5264	E-2	340	10528	E-3	170	21056
F-1	640	5593	F-2	320	11186	F-3	160	22372
F#1	600	5965	F#2	300	11931	F#3	150	23863
G-1	568	6302	G-2	284	12604	G-3	142	25208
G#1	53	6678	G#2	268	13356	G#3	134	26713
A-1	508	7046	A-2	254	14092	A-3	127	28185
A#1	480	7457	A#2	240	14914	A#3	120	29829
B-1	452	7919	B-2	226	15838	B-3	113	31677

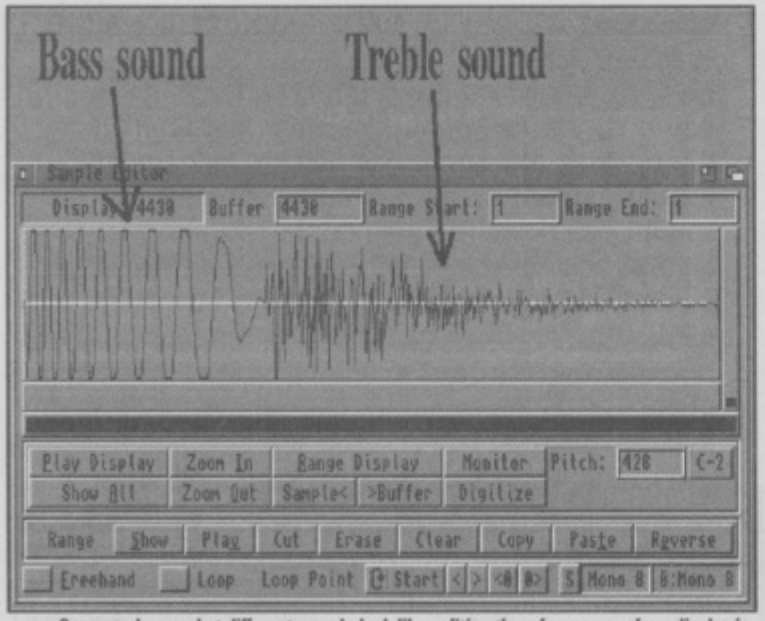
You will notice that the sample rate of C-2 is double that of C-1, while the period is half that of C-1. Armed with this knowledge you can calculate sample rates and periods above and below the range shown here.

Sound	Suggested rate (kHz)
Tuned instruments	**16,726**
Vocals	**22,372**
Single drum sounds	**22,372**
Drum loops	**22,372**
Triangle and extreme high pitches	**28,185**
Bass notes	**16,726**

Reading waves

One of the biggest advantages the Amiga has over dedicated MIDI samplers is the fact that you can actually see the sampled wave on screen, large as life. If you've ever moved from visual sample editing to using a MIDI sampler that has nothing but a numeric readout you'll know what an enormous aid this is to sample editing. The key to getting the most from graphical sample editing is learning to read sound waves.

When you examine a sound wave for the first time it normally looks just like a random series of spikes and humps. However, if you use the zoom controls on your sample editor to play and examine specific parts of the wave you should start to see a



Once you know what different sounds look like, editing them from a waveform display is much quicker and easier.

few patterns emerging. Loud parts of the sound coincide with parts of the sample wave that veer from the very top of the wave display to the bottom, while quiet parts are signified by a much smaller wave that wobbles along the centre line. Also, parts of the sample that contain high frequencies, such as cymbals and drums, will be displayed by a lot of very tightly packed spikes in the wave display. At the opposite end, low frequencies are drawn on the wave form as long smooth curves. A sample of a bass drum and a cymbal would have the long wave of the bass drum broken up by the spikes of the cymbal. A complex sound, such as the human voice, will appear as a succession and combination of various frequencies.

Take a look at the sample waves here and then compare them to some of your own sounds in your sample editor.

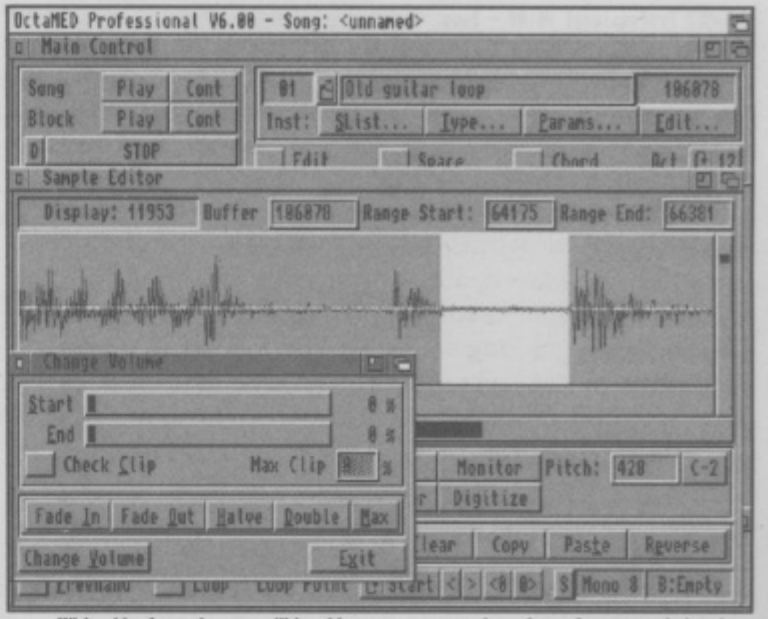
Once you know what sounds look like you'll be

able to trim down a sample to exactly the part you want in a matter of seconds. For example, if you are sampling a one-bar drum loop from a sample CD you'll often find that the first note of the following bar has been included on the CD, so if you were to loop the whole thing it would jump and sound out of time. When you know what you're looking for, chopping off the last beat can be done without even listening back to the sample.

Removing noise

Noise can also be seen on a sample wave in many cases. 'Noise' in this case does not mean the same thing as 'sound'. Noise is any unwanted frequencies in the recording, which usually takes the form of high frequency hiss or low frequency hum.

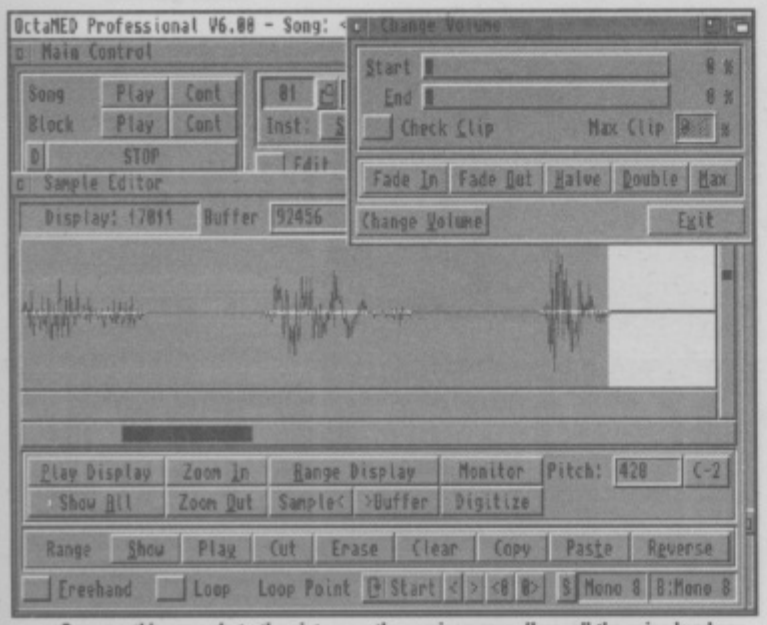
If you have a sample which is loud at the start, then has a short silent gap and then has another



With a bit of practice you will be able to see unwanted sections of your sample just by looking at it. Here the highlighted section is unwanted hiss, which is easily removed.

loud part (a rhythm guitar loop for example) you may find that hiss or hum noise creeps into the bit that's supposed to be silent. This will look like small but rapid undulations travelling along the middle of the waveform display. The same noise is probably present on the whole of the sample but will not be so obvious where the volume of the original sound is substantially greater than the volume of the noise.

So, removing this noise from the silent part is required. There are a number of ways you can do this. You could filter the relevant section to remove high frequencies in the case of hiss, or low frequencies in the case of hum. This is the best route if there are still traces of the original sound in this quiet part, as they should remain fairly unaltered by this filtering. If all you want is complete silence in the gaps, the easiest thing to do is highlight the noisy area and reduce its volume to zero. Even the most



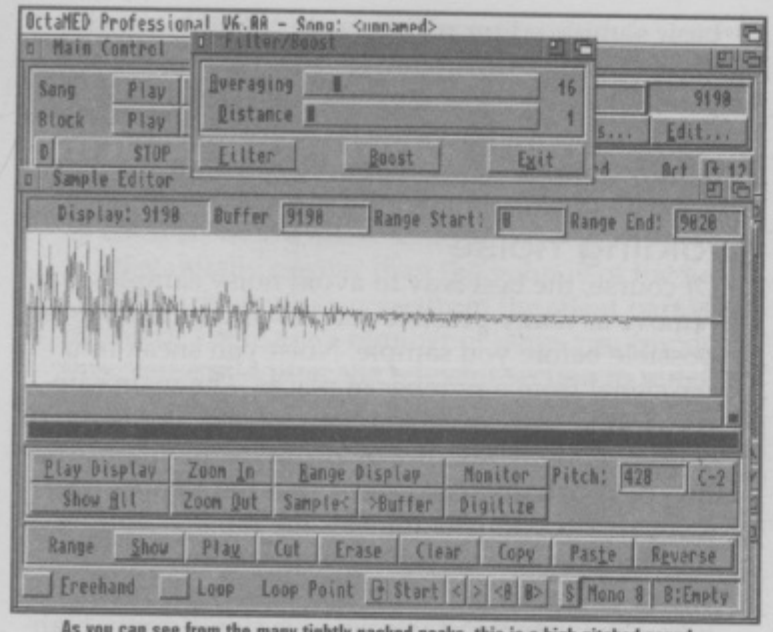
Compare this example to the picture on the previous page. Here, all the noise has been removed by changing the volume of the noisy parts to zero.

basic sample editor will have this ability. A tip for users of GVP's DSS8 sampler is to turn on the software filter (not the Amiga low-pass filter) just before sampling bass sounds. This eliminates almost all high frequency noise from the resulting sample.

Avoiding noise

Of course, the best way to avoid noisy samples is to remove as many possible sources of interference as possible before you sample. Noise can sneak into the signal from a number of places. The main safeguard is to make sure you have a good strong signal coming into the sampler by using the monitor function of your sampler to check that the sample wave just very occasionally touches the top and bottom of the waveform display without flattening out. This will give you an optimum 'signal to noise ratio', where the volume of the signal is significantly higher than that of the noise.

Ironically most of the noise you will encounter will generally come from the computer and music systems themselves. Prime candidates for noise pollution are TVs, monitors and internal hard drives. The best way to test for noise generated by your system is to sample some silence with nothing connected to your sampler's input. If you play back the sample and there's noise you can start a process of elimination, repeating the process with various bits of the system disconnected until you find the culprits. If you really care about clean samples, and you have, for example, an A1200 with an internal hard drive, it is worth disconnecting it and booting from floppy disk to see if there's a significant improvement in sound quality. By the way, these devices will mainly affect the quality during sampling, but it's also worth turning off non-essential devices if you are recording a master tape from the Amiga.



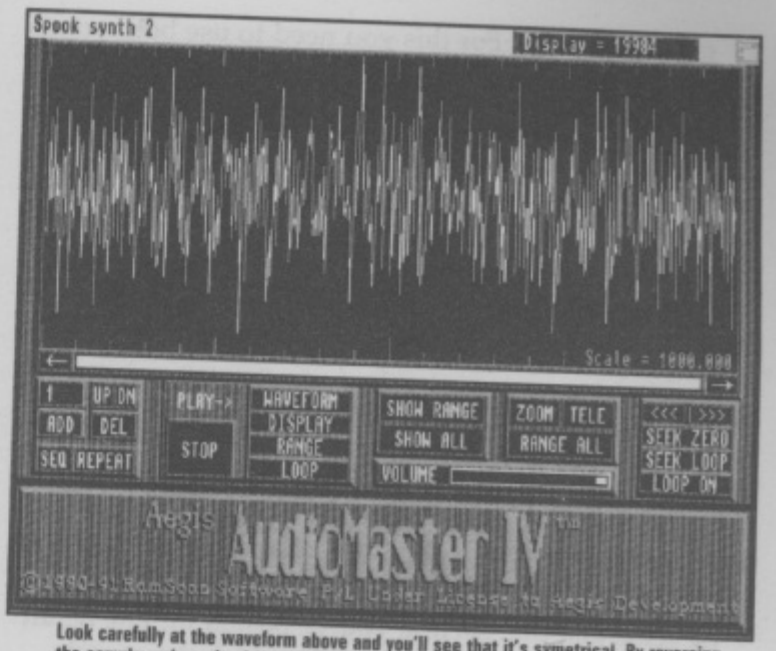
As you can see from the many tightly packed peaks, this is a high pitched sound. Boosting treble frequencies can make a sample sound much clearer.

Boosting frequencies

While filters are useful things for reducing noise, booster options can be just as useful for enhancing the frequencies that you want to focus on. For example, boosting the high frequency content of certain drum samples can make them sound much brighter and cut through the mix. Likewise, the lower end of bass sounds can be boosted to give more 'oomph'. Creative use of filtering and boosting specific frequency bands is one way to inject new mood and flavour into drum loops and other sounds.

Invisible looping

In some cases you'll want to add loops to your samples. For example, a sustained instrument sound such as a flute could be looped and held for as long



Look carefully at the waveform above and you'll see that it's symetrical. By reversing the sample and pasting it onto itself, a complex sound can be looped very smoothly.

as required. A looped sample will have two markers: one for the start and another for the end. The loop start marker does not have to be at the start of the sample, so you can play a sample so that the first bit plays just once, then the parts between the loop markers play indefinitely. The tricky part here is finding the right loops points so that the sample continues without either jumping or clicking.

First you need to get the hang of looping without a click. A click occurs when the waveform jumps very suddenly from one position to another (from the bottom of the wave to the top for example). Avoiding this is fairly simple so long as you make sure that the start and end markers are both positioned at places where the waveform crosses the middle line of the display. An alternative method is to use two points where the wave reaches either the top or the bottom of the display.

Creating a natural sounding loop requires a little

more technique. For this you need to use both your ears and your eyes. What you need to find is a place on the sampled wave where the sound either sustains with almost exactly the same sound for a while, or where it wobbles back to something like the first part of the sound. You need to find a smooth join. It's a bit like putting up wallpaper, when you have to line up the pattern of the new roll with the one you've just put up. The best way to do this is by listening and examining the sound wave, looking for sections that look similar. When you think you've found a suitable pair of loop points, set up your markers and try them out. If you're unsuccessful you'll have to keep on trying!

There is a way of cheating. You can copy a large section of the body of the sample (the part you want to loop), paste it onto the end of the sample, then reverse just that section you've pasted in. The result should be a 'butterfly' effect, in which the sample plays and then the second section is played again in reverse. If you've been careful with your cutting the join should be free from any glitches or clicks. You can then loop to mirrored part of the sample.

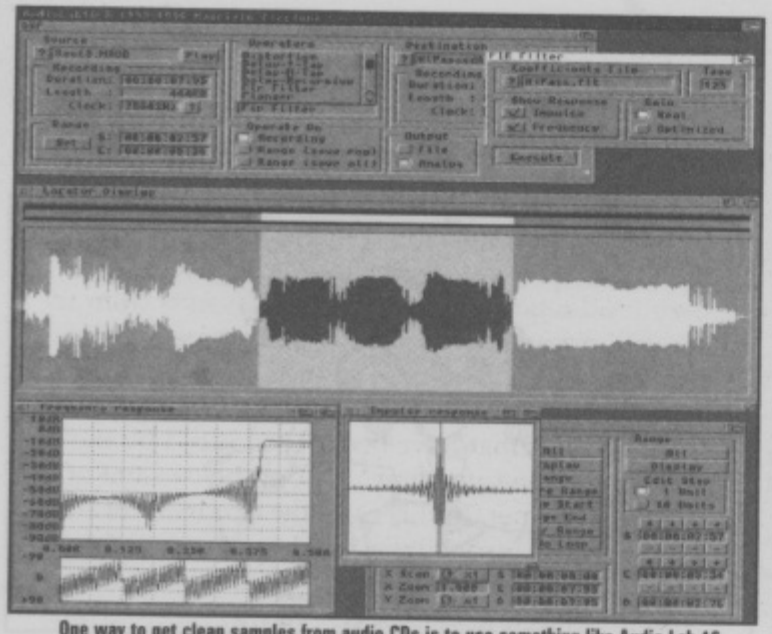
Sound Effects

Sound effects crop up everywhere: demos, games, presentations, soundtracks and even the Workbench likes to bleep and buzz aural signals at you. If you're interested in developing any of the above then the ability to create your own sound effects is real boon, even if all you want to do is add a sound sample to your boot-up sequence.

The techniques and processes involved in creating sound effects can be different for each particular application but we'll start with a look at making standard IFF sample sound effects which can be used in almost all of these cases.

Sample CDs

Obviously if you're using sample sounds, the quickest and easiest way to get results is to find the sound you want and sample it. This is indeed the best option in many cases, especially when individuality is not a high priority. If you decide to take



One way to get clean samples from audio CDs is to use something like Audio Lab 16, which allows you to copy the digital audio data from the CD onto disk or memory.

this approach you then need to find the sounds you want to sample. Video tapes are a common source but there are associated problems. First of all there's sound quality – VHS is not known for its high fidelity audio and anything but a first generation copy will usually be extremely noisy. The other problem regards copyright. Although this won't be important if all you are doing is adding a sample to your Workbench, you will still be in breach of copyright (and hence breaking the law) if you record a sample from a movie. This will have to taken into consideration if you are working on sound effects for a game or anything else that is to be made available to the public. Then again, this would not really apply if you took just a split second of gunfire sounds rather than a whole line of recognisable speech (although technically it would still be an illegal breach of copyright).

The best source for sound effects samples is a

dedicated sample CD. Sample CDs come in both audio and CD-ROM formats and are usually filled with thousands of different sounds presented in a sampler-friendly format. These CDs can be separated into two types. The first will have had its contents cleared for copyright infringements or will include totally originally generated sounds, so either way you are free to use the sounds in your own productions without fear of lawsuits from the sounds' original creators. The other type is more common and will contain sounds from a variety of sources. These may contain samples from copyrighted recordings that have been reproduced by the sample CD manufacturer without the consent of the copyright owner. In this case, the producer of the sample CD is breaching a number of copyrights, although in most cases the CD producers get away with it (though not always). You may need to gain permission for the use of sounds from such a CD from the original copyright holders. On other occasions, the producer of the CD may have cleared samples for release on the CD, but this does not necessarily mean that then end user is free to use them at will.

Copyright law is a rather grey area when it comes to sampling parts of existing works for use in a new piece. The way to get away with it is to alter the original sound to such a degree or use it in such a way that it is no longer recognisable in its new surroundings. As far as sound effects go, copyright problems are only likely to arise with the use of phrases of speech or particularly unique and well known sounds. Be safe: always check!

Sample rippers

There are other sound sources closer to home. Many games and demos will have their sound data stored in non-standard formats making it impossi-

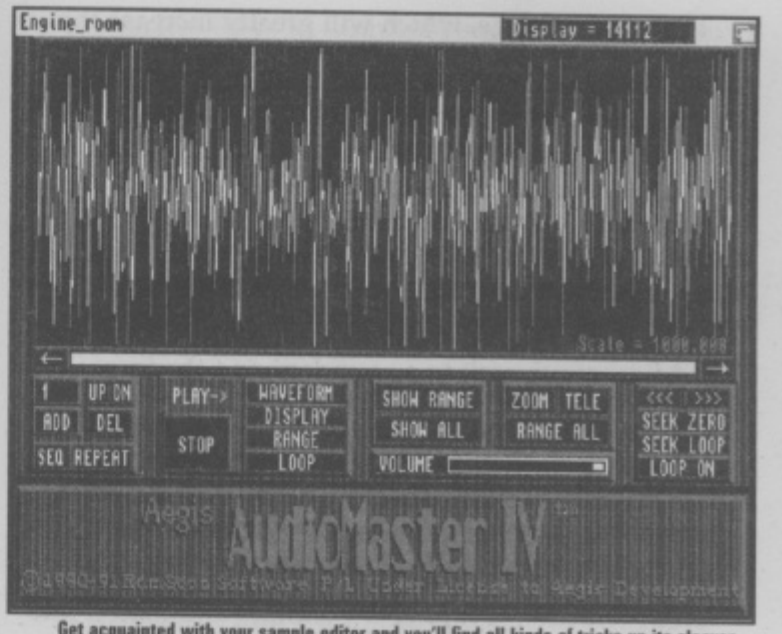
ble to load their samples and soundtracks into conventional audio programs. However, when you reboot your Amiga, much of the memory will remain unchanged and the sounds could still be resident in RAM. Sample rippers and module rippers allow you to scour the memory of your computer for any samples or music modules that may be present. In the case of module rippers, the utility will tell you if it has found anything it recognises and ask if you want to save it out to disk. You can then load it into the relevant software and 'borrow' its samples for use in your own work. Sample rippers work along the same principle, but this time it's up to you to decide when you've found a sample. Most sample editors have a RAM Scan option which allows you to replay the contents of the RAM as if it were a sample. Most of this will sound awful but when you locate a proper sound you can highlight it and save it out to disk.

Any samples you obtain this way will be subject to all the normal copyright limitations, so it's best to alter them with some of the following techniques to avoid any trouble and make them 'original'.

Sample editor tricks

Everyone wants their sound effects to be original – to make the listener sit up and take notice. Once you've got your basic sound sitting in your sample editor there are a number of tricks you can use to spice it up and squeeze extra value from it.

Looping effects: This isn't so much about being tight with memory but more to do with giving yourself more scope for extra sounds. For example, if you can reduce a 30K sample to 3K with no loss of detail or sound quality, you've just earned yourself an extra 27K for a brand new sound effect. This kind of memory saving isn't always possible and in many cases you'll find that what seems to be a fairly



Get acquainted with your sample editor and you'll find all kinds of tricks up its sleeves. Quite often it's mis-use of features that lead to the most original results.

long sound is in fact a very short one that's been looped. Listen very carefully for repetitions in your sound effect as these will indicate a looped sound. These repetitions may take place extremely rapidly and could be too fast to hear, so try replaying your sample at half speed. Also take a look at the waveform. If it follows a repetitious pattern then you can take just the first instance of the pattern and loop that, chopping off all of the rest of the sample. Sounds that are likely candidates for looping include background drones (like the bleeps and hum of the Starship Enterprise or the chirp of crickets in the jungle), engine noises, white noise (such as wind and waves), machinery, running water and many others.

Remember that if you are going to use these samples from within a tracker or one of your own programs (C, Assembler, Blitz Basic, AMOS etc.) you will be able to alter the volume and pitch of the

loop at that stage, which will greatly increase the sonic possibilities. Check the Programming and Trackers sections of this chapter for more in this area.

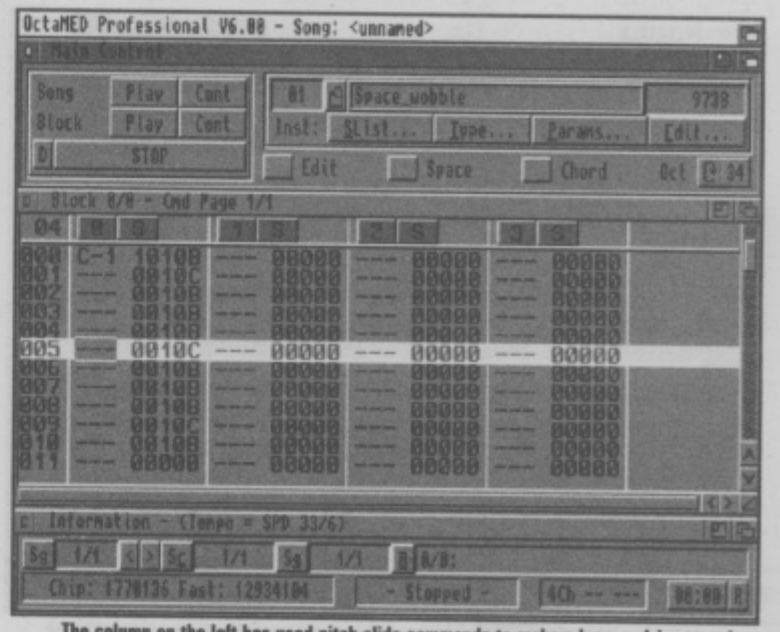
Phasing: Phasing is a side effect of mixing two copies of the same sound together, where the pitches and speeds of each copy are slightly different. The resulting sound will be similar to the original but will have a 'whooshing' sound that appears to move up or down in pitch. This is very useful for adding movement to a sound, giving the impression that the subject is moving across the scene. As an example, have a go at making your own jet plane fly-by sound effect. You'll need a 'white noise' sample that should be a few seconds in length. If you have OctaMED you can use the Create Noise option from the sample editor to make some white noise from scratch. Now save the sample and load it into a sample editor that has a phase function. AudioMaster IV (from the November 1995 issue of CU Amiga Magazine) has this in the form of its Mix function – just adjust the Offset Value to anything you like. Perform the phase on the white noise and you'll get a dramatic sweeping sound as if a jet plane had just flown overhead. Experiment with phasing effects on any other sounds you want to process.

Echoes: Echo effects are very useful if your sound effect sample is cut off suddenly at the end. By adding an echo to it, the abrupt ending is smoothed over with little repeats that gently fade away. A more original use of the echo function is to set the echo rate at a very high figure (or a very low one, depending on how your sample editor works). The idea is to get the echoes occurring in very quick succession. If the echoes are close enough together, the result is a metallic sound rather like the effect used to process the Robocop voice. This is one of

the easiest ways to disguise your own voice, so even if you have the most unhip of regional accents you can record tough dialogue samples worthy of the most fearsome intergalactic warrior.

Tracker tips

Even if you're not writing music, trackers are very useful for stringing together a serious of sound effects. The fine control over the samples that trackers offer is ideal for many sound effects applications. For example, if you were to use the technique explained earlier and loop a small sample for use the sound of machinery, engines, laser guns or whatever, you can embellish the original sound with realtime effects such as pitch slides, volume fades, vibratos and arpeggios. By combining volume and pitch slides, a tiny sample loop can be transformed into a hulking great space cruiser

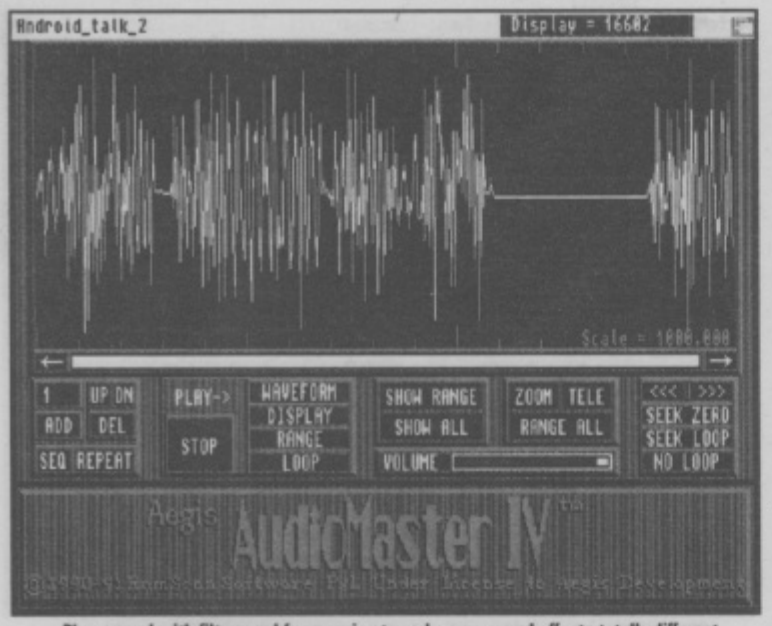


The column on the left has used pitch slide commands to make a long evolving sound from a tiny sampled loop. Other effects commands could be used in addition.

appearing from the distance, switching into warp drive and shooting off into the distance. It's well worth investigating this avenue if you need to add sound effects to an animation. Time the animation and make notes of which sounds need to be cued and faded at which specific times. You can then construct your sound effects module accordingly. The animation and sound effect module could then be replayed from within a multimedia authoring package (such as VideoStage Pro from the March 1996 issue of CU Amiga Magazine).

Programming tips

For those who like to program their own games and demos, the possibilities are greater still. First of all there's the fine control you have over the basic sample replay parameters (pitch, volume and so on). In addition, you have the ability to do much more

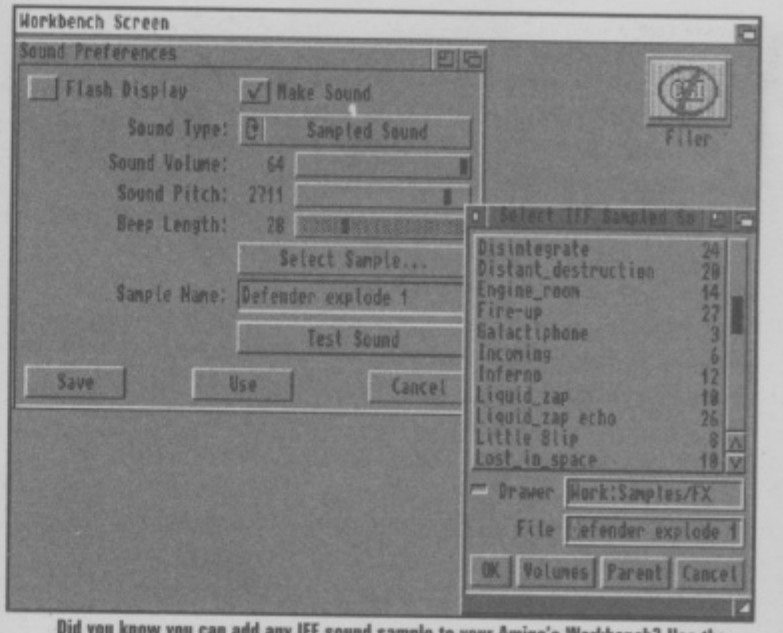


Play around with filters and frequencies to make your sound effects totally different from the originals and feel free to distort and overdrive sounds if necessary.

with the sound. Algorithms and random number generators can be introduced to add complex and unpredictable angles to your sample's pitch and volume, and these alone can transform a sound. With some imagination and inventive programming you can synthesise whole new sounds from what were previously ordinary samples.

Workbench samples

Adding your own samples to your Workbench is very simple. Recent versions of Workbench come with a Preferences icon dedicated to the error or alert sound. This allows you to select either a simple beep or a specific sample which will be loaded during the boot sequence. For this reason if you don't have a hard drive you'll need to include the sample file on the Workbench boot disk. You can set the replay rate by moving the slider. Use the Test button

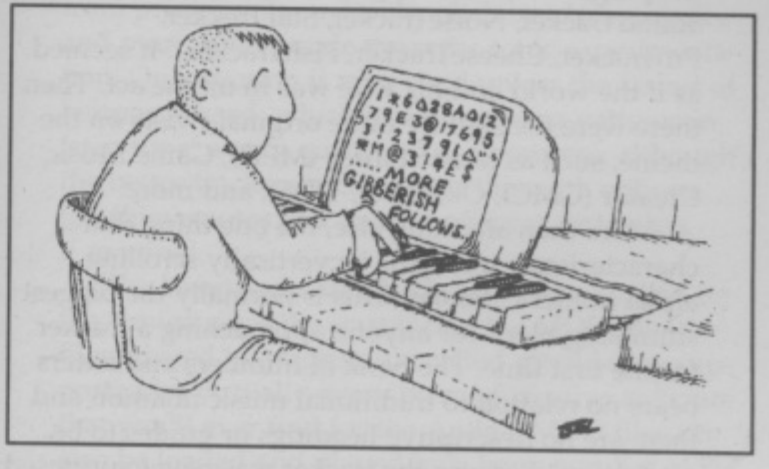


Did you know you can add any IFF sound sample to your Amiga's Workbench? Use the Sound Preferences options and then select one from your hard drive.

to find the right replay speed, then click the Save button to make the changes permanent. The selected sound will now play whenever you hit an error or make an unavailable selection from within any system compliant application or the Workbench.

chapter 5

Sequencers and Trackers



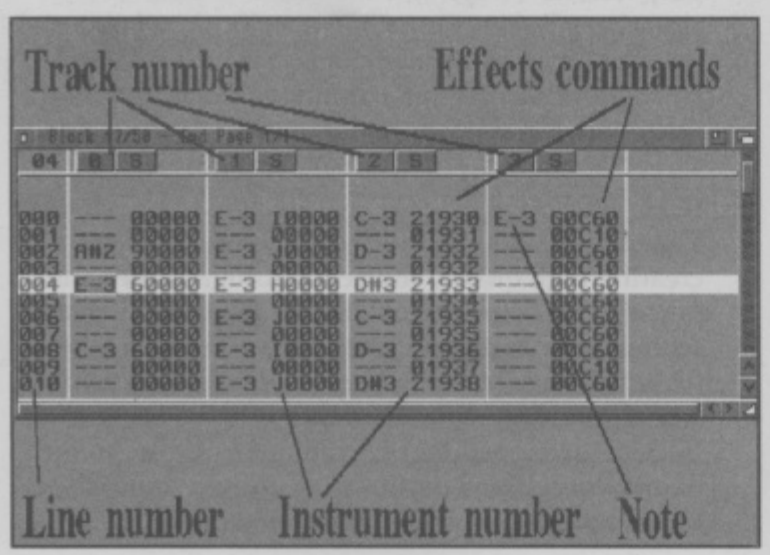
There are two families of music creation software for the Amiga: trackers and sequencers. While there is some common ground, the two types work in very different ways and are suited to different situations. Before we go into specific detail about any one particular tracker or sequencer we should be sure of exactly what comprises a tracker, and what makes a sequencer.

The tracker

The tracker was originally developed as a way of creating high quality music for Amiga games and demos. The final product had to be very efficient with memory and processor power but also take full advantage of the Amiga's then revolutionary sound hardware. SoundTracker was the original tracker, developed by programmers on the Amiga demo scene. Third parties took it upon themselves to continue the development of SoundTracker by

adding their own features to the program and redistributing it. Some of these amended versions went out under the name SoundTracker but many altered the first part of the name to reflect the changes in the program. Before long there was the choice of SoundTracker, NoiseTracker, StarTrekker, ProTracker, CheeseTracker, FishTracker... it seemed as if the world and his wife was in on the act. Then there were the slightly more original twists on the theme, such as Music Editor (MED), Game Music Creator (GMC), Oktalyser, TFMX and more.

More than anything else, the one thing that characterises a tracker is its vertically scrolling alpha numeric display. This is normally the biggest stumbling block for anyone approaching a tracker for the first time. The bank of numbers and letters bears no relation to traditional music notation and there are no descriptive headings or guides to be seen. Why? Because the tracker was never supposed to be a tool for the traditional musician and any compromises it made to address that would reduce its use a compact musical tool for games and



demos. Power over Paula is what makes the tracker such an attractive option. Most trackers have a sample editor built-in, so you can grab new sounds half way through making a song and edit them to your requirements. The acute control over everything from precise volume levels, pitch bends, arpeggios and more gives ample room for sonic experimentation. Quantisation is very rigid unless the fastest of tempos is used, which makes entering patterns in 'step time' a very quick and easy process, although the better trackers will counter this with options to achieve notes that are just off-beat, or triplets if required.

The beauty of a standard that's been around on the Amiga since the start is that the MOD file (the files created by trackers are called modules) is supported by virtually every piece of creative software that you'll ever find for the Amiga. MOD files can also be loaded and played by a large number of PC and Apple Mac programs. Over the last few years programmers have been developing alternatives to the MOD format with extra features, such as 8 or more voices, 14-bit output, MIDI sequencing and more, so in fact there are quite a few 'standards' of the MOD format.

The main contenders

There are many variations on the tracker theme for you to choose from. Here are some of the leading contenders for your attention.

ProTracker

ProTracker is the choice of the majority of musicians who write primarily for games and demos. An accomplished programmer will be able to slip a ProTracker module into a game or demo without batting an eyelid. ProTracker conforms to the tracker tradition of a non-standard interface; there are no

pull down menus and all the buttons are arranged in a rather pokey collection of banks, some of which change to reveal alternative banks if you click on the right one. Once you know your way around the interface there shouldn't be too many problems, but the assumsions the program makes about your Amiga, its disk drives and its filing systems can be frustrating.

You won't find any MIDI support or snazzy eight voice features but there is a sample editor. ProTracker is still widely used for a couple of reasons. First and foremost is familiarity – if you've been using it for the past five to ten years, changing to an alternative system isn't an attractive option. The other reason is simply because it is widely used, which in turn means that there's plenty of support from the rest of the Amiga scene. However, if you're new to it all, you may be better off trying out one of the more ground breaking alternatives.

ProTracker is public domain, the current version is 3.01 and it's available from all good public domain software suppliers.

OctaMED

Any regular reader of CU Amiga Magazine will know all about RBF Software's OctaMED, so we'll keep it brief. At the time of going to press the latest release is Version 6, also this is soon to be superseded by the next update, OctaMED SoundStudio V1. Originally based on the tracker theme, OctaMED adds a number of power features, such as comprehensive MIDI sequencing alongside the samples, synthetic sound generation, a standard Workbench 2 interface with menus and windows and full ProTracker compatibility. SoundStudio will offer more, including up to 64 channels of Amiga samples that can be output through the Toccata 16-bit sound card with full stereo panning controls and

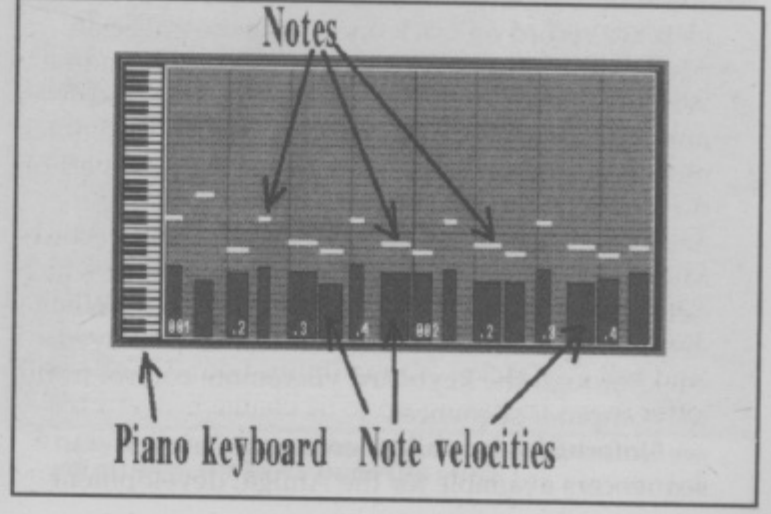
realtime echo effects. If you want to combine MIDI sequencing and powerful Amiga sample control, OctaMED is definitely the way to go.

Musicline Editor

One of the most original twists on the tracker theme has come from Musicline Editor (Mline for short). The main attraction here is that you can create instruments by loading in samples and then assigning a number of synthesis values to them. For example, you could load a sustained string sample and give it some resonance, which would change it from an ordinary sample into a more interesting sound with its own movement and character. At the moment Mline is still in its early stages of development but it's worth checking out. With more support from users it could grow into a force to be reckoned with. Musicline Editor is shareware, available from any good public domain source.

Sequencers

In contrast to a tracker, the main aims of a sequencer are to present the musician with a quick



and easy way to record, edit and replay music from MIDI instruments (although Amiga samples are usually supported to some degree).

Sequencers have no place for scrolling lists of numbers and letters. They prefer to display their musical data in the form of a 'piano roll' display. This takes its name from the rolls of paper used to store musical scores for self-playing pianolas. A piano roll display is read from left to right using a horizontally scrolling window. Along the left edge of the display is a representation of a piano keyboard stood on its end, so the lowest note is at the bottom and the highest note at the top. This piano is used to indicate the pitch of the notes, rather like the numbers running up the side of a bar graph indicate the values of the bars. So each note is given a vertical position according to its pitch, while its duration is represented by the length of the note's bar. In addition to this, each note may also have a vertical bar which indicates its volume or velocity.

A typical use of a sequencer would involve a setup where there was a MIDI keyboard plugged into the Amiga, with this keyboard acting as both an input and output device. The sequencer would be set to record on track one, while the musician played a bassline along to the tick of a metronome. When recording had finished, any badly timed notes could be quantised and corrected with a quick mouse click or menu selection, then the next part of the music could be recorded onto track two (perhaps a chord sequence). The sequencer only records MIDI data, which contains information about which notes where played when and for how long. When everything has been recorded it can all be played back through the keyboard via remote control from the computer sequencer.

Unfortunately while there are quite a few sequencers available for the Amiga, development

has ceased on all fronts. The advantage of this is that you can pick up some very powerful software for little cash if you shop around.

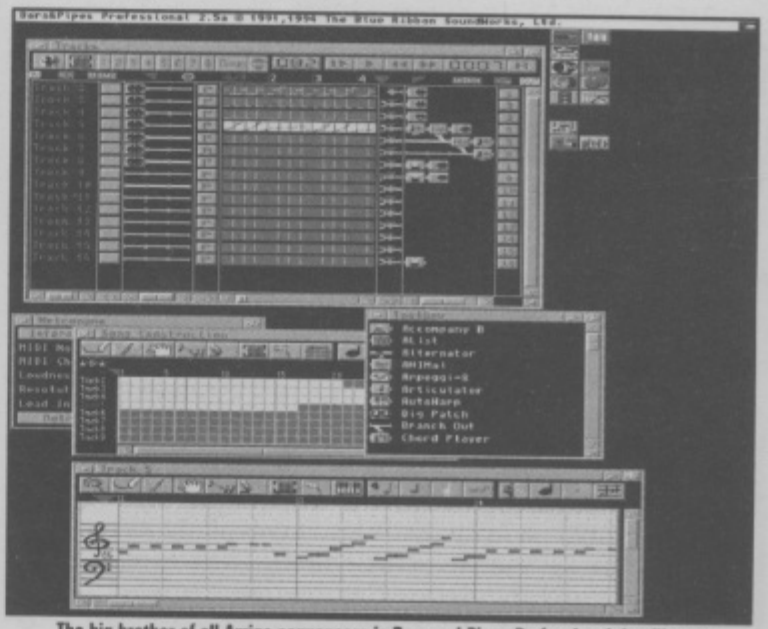
The contenders

Here are the main players in the field.

Bars and Pipes Professional

Bars and Pipes Professional is without a doubt the king of Amiga sequencing, offering a range of features, plug-ins and overall power that knocks the competition for six. Bars and Pipes likes a challenge. It's almost as if it's saying "Go on, give me you best shot ... your biggest MIDI set-up ... your most demanding music project ever" and it still manages to take it all in its stride.

Much of its success lies in the system of plug-ins and controllers. These can be used to add creative

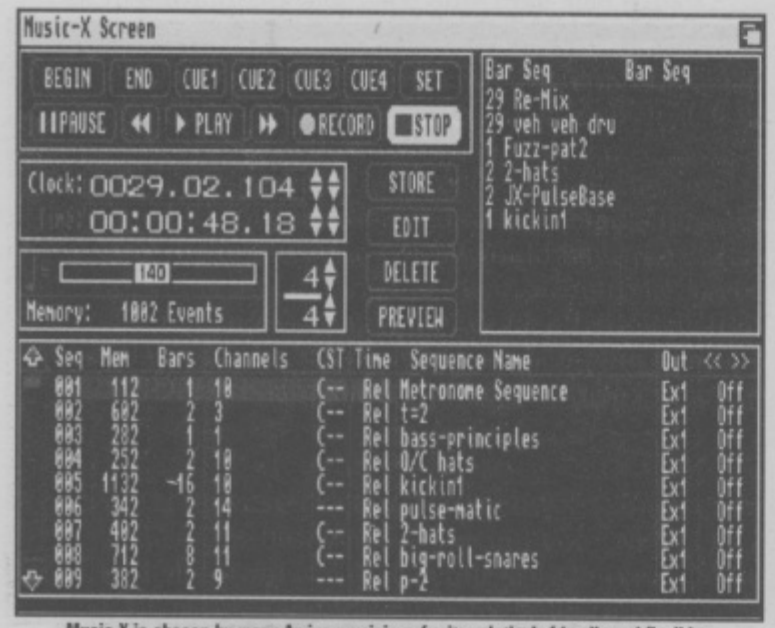


The big brother of all Amiga sequencers is Bars and Pipes Professional. It will grow with your system, no matter how expansive that may be!

musical effects to your sequence, or to integrate additional hardware seemlessly into the sequencing system. For example, there are specific plug-ins for direct links with Triple Play Plus (a 48-way MIDI interface), Sunrize AD516 and Toccata 16 bit hard disk recorders and plenty more. Bars and Pipes is at its best when run on a well stocked big box Amiga and a large flicker-free monitor to take advantage of its excellent display features that are based around a colourful set of icons and windows.

Music X 2.0

Music X stole a march on the rest of the Amiga sequencers by simply being there at the beginning. Although it can't hope to compete with the bag of tricks that is Bars and Pipes, it has plenty of its own to tempt the Amiga musician. The fact that it doesn't have a massive array of options is a positive



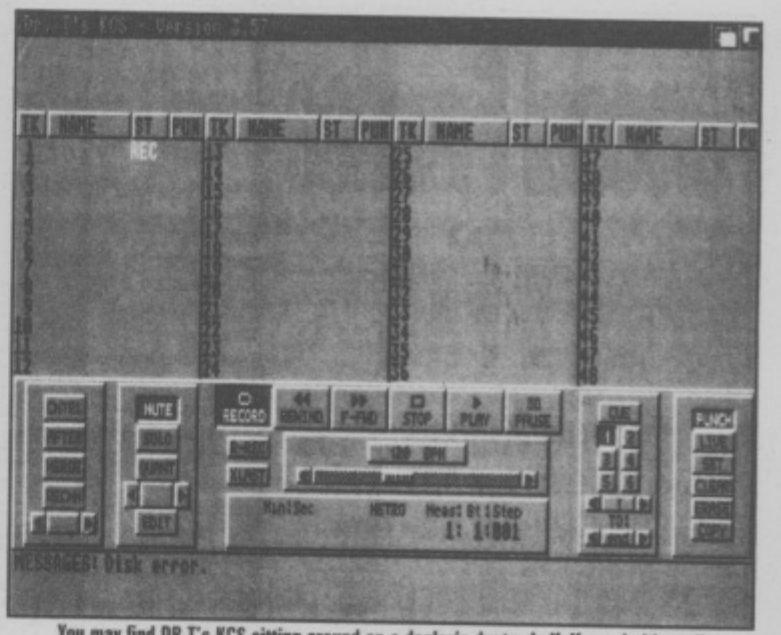
Music X is chosen by many Amiga musicians for its relatively friendly and flexible approach to MIDI sequencing, and also just because it has been around for so long.

point for those working on lower specified machines, and also those who like to work in a more simple uncluttered environment.

There are some nice recording and structuring methods on offer in Music X which allow you to record parts and use them as subsequences in the overall sequence. Many find that the features for handling Amiga samples are the best of any sequencer, so if your music tends to be primarily MIDI-based but you still want good control over Amiga samples this is probably your best option.

KCS 3.0

Dr T's KCS (Keyboard Controller System) went out with a bang a few years ago but you may still find this very powerful sequencer gathering dust on a retailer's shelf somewhere. The last release was a combination of KCS (the main sequencer), Tiger



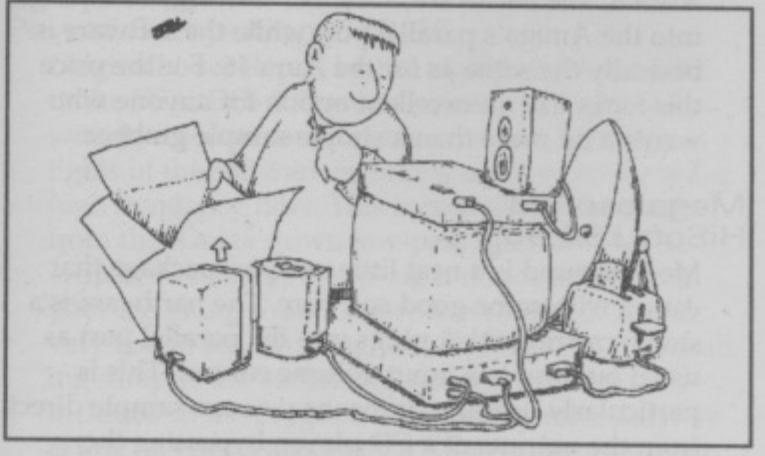
You may find DR T's KCS sitting around on a dealer's dusty shelf. If you do it's well worth investigating. While it's not the most complete system it still packs a punch.

Cub (the display system) and Automix (an automated MIDI mixing tool).

This system could not be described as user-friendly but it does offer a good deal of control over a large MIDI setup. The most interesting part is the automated mixing desk. This allows you to record volume changes (or in fact changes of any MIDI controller) via a mouse-controlled virtual mixing desk. If your real mixing desk is equipped with flying faders you can even control those from the program's Automix section.

chapter 6

Amiga audio hardware add-ons



8-bit samplers

Most Amiga 8-bit Amiga samplers follow very similar lines. They consist of a stereo sampling cartridge which plugs into the Amiga's parallel port and some software which reads the data from the cartridge and allows you to edit and save the samples. There's very little to choose between the hardware cartridges, so most buying decisions are made on the strengths or features of the accompanying software. Most sampler cartridges and software can be interchanged with different brands. For example, you can use the Megalosound cartridge directly with the built-in sampling software in OctaMED. All of these use the Amiga's own hardware to replay the sampled sounds. The samples created with these packages can be used in any Amiga music program.

Aura 8
HiSoft £34.95

When HiSoft developed their original Aura sampler (see the section on 16-bit samplers) they came up with some impressive editing software. Now the software is available for 8-bit users in the form of Aura 8. The hardware is a small cartridge that plugs into the Amiga's parallel port while the software is basically the same as for the Aura 16. For the price this looks like an excellent option for anyone who wants a bit more than a simple sample grabber.

Megalosound
HiSoft £34.95

Megalosound is a neat little sampler package that comes with some good software. The hardware is a stereo cartridge that plugs into the parallel port as usual but also has input volume control. This is particularly useful as it means you can sample direct from the outputs of a CD player, bypassing the potentially noisy amplification stage. You could do this with any sampler but the volume control means that if you are sampling from a very loud CD you can avoid distortion.

The Megalosound software has some quirks in its interface, but for some reason this seems to be par for the course when you're dealing with Amiga sampling software. There are also some useful effects available for processing samples, especially if you like distorting sounds to creating new ones. Excellent value.

Technosound Turbo 2 Pro
Emerald Creative £26.95

Technosound has been around for years. Its latest incarnation sees it sporting a large number of 'just for fun' realtime effects. Unfortunately the sound quality of many of these mean that they really are just for fun. There's a built in tracker which makes it

relatively easy to try out your samples in a musical context, although it is very basic and not compatible with the .MOD file format. On the subject of the software front end, Technosound is the worst of a bad bunch. Nevertheless, it has its fans.

DSS 8 Plus
Power Computing £39.95

Originally developed by the highly respected GVP in the USA, DSS 8 Plus has a clear plastic cartridge with its internal components on show. The highlights of the software include a unique pre-sampling high frequency filter. This is completely separate from the Amiga's own low-pass filter, and when switched on before sampling it removes hiss from your incoming sound before it is sampled. This is very useful for sampling bass sounds, and the resulting samples are surprisingly pure. A tracker is included in the program and although the software is low on effects processes it's one of the most user-friendly editors.

16-Bit Samplers

Things are rather different when it comes to 16 bit samplers. As the Amiga has no in-built 16 bit recording or replaying facilities, each sampler takes its own approach, interfacing in different ways and using specifically designed hardware and software. This means that in order to use the resulting samples in other software, the software will need to have specific support for that particular sampler and its files.

Aura 16
HiSoft £79.95

The cheapest route into 16-bit Amiga audio is Aura 16, although it doesn't actually offer 16-bit sampling or replay – instead it samples at 12- bit resolution, converts this up to 16 bits during the editing and processing stage and then back down to 12 bits for

output. Aura connects to an A1200 or A600 via the PCMCIA slot. There are stereo inputs and outputs on the cartridge, with stereo pass-through inputs for combining your standard Amiga audio with the Aura output.

One of the best things about Aura 16 is the selection of high quality realtime effects that are available from the software. These are especially remarkable because they allow you to combine more than one process at a time, such as phase and echo for example. Aura also has excellent sample processing features. Third party support is available in a limited form from OctaMED 5.04 upwards, in which case you can substitute one Amiga channel for a mono Aura 12-bit channel.

Toccata
White Knight Technology £299

Toccata is a Zorro card for all 'big box' Amigas. It has been designed by MacroSystem specifically for use as a hard disk audio recorder with their V-Lab Motion card in a digital video editing set-up, in which case it handles the soundtrack while the V-Lab Motion deals with the pictures. Samples can be recorded to and played back from both RAM and hard disk. Toccata offers stereo sampling at rates of up to 48kHz in 16 bits. Unlike most samplers, the sampling and replay rates must be chosen from one a number of presets. These include 44.1kHz (perfect for mastering to CD) and lower rates such as 32kHz (the rate used by Akai's SO1 entry-level MIDI sampler). This means that normally it cannot be used to sample a single note and then use this to replay a melody, since there are not enough presets to cover all the notes that would be needed.

However, when used in conjunction with OctaMED SoundStudio, songs can be built from both 8 and 16-bit samples and fed to the 48kHz 16-bit output of the Toccata, which gives superior sound quality to using the Amiga's standard 8-bit output. In this case each track can have its own stereo pan position and echo effects can also be added in realtime.

Samplitude is the software supplied with the Toccata, featuring a good selection of basic editing tools and a few effects. Toccata samples can also be strung together into a single track sequence using Samplitude's Playlist features. Bars and Pipes also offers Toccata replay features. If neither SoundStudio nor Bars and Pipes is your sequencer of choice, Toccata will be of most interest as a hard disk digital recorder. For this job it could really do with some more advanced software to match professional systems on other platforms.

Sunrize AD516
£150-£200 second hand

The first ever 16-bit Amiga sampler was the Sunrize AD516. Like the Toccata, it's designed as a hard disk-based digital mastering system, but unlike the Toccata the AD516 sports two stereo channels instead of just one. Sunrize AD516 is also a Zorro card, and once again, like the Toccata it too is can be paired with a digital video card, specifically the DPS Personal Animation Recorder (PAR). While the AD516 does have support from Bars and Pipes, it is not of much use to anyone who wants a 16-bit sampler for use as a musical instrument.

Where the AD516 really scores is as a hard disk recording, mastering and audio editing system. The latest version of its companion software gives precise control over your recordings and has a very user-friendly play list sequencer that works on a drag and drop principal. For hard disk mastering and digital audio work this is definitely the pick of the crop.

Miscellaneous hardware

There are also some other interesting bits and pieces available to enhance and manipulate your Amiga's sound. The standard line level stereo analogue output is compatible with all audio recording equipment, but here are a couple of tailor made units that are especially geared towards use with the Amiga.

Sound Enhancer
Omega Projects £39.95

One of the problems with 8 bit sampling is that it can have the effect of producing slightly dull sounding samples. The Sound Enhancer is a cheeky piece of kit that is very effective and also very simple. It's a small box that sits between the Amiga's audio outputs and your amplifier or mixer.

It works by boosting certain preset bass and treble frequencies. The level of the bass boost cannot be changed, but the one control knob on the unit can be used to cut or boost the treble frequencies. This is not a miracle worker by any means, and if you are using samples played at low rates then the treble boost will only emphasise the distortion. However, if you are working from good samples, the effect can be amazing, giving your top end more sparkle and adding plenty of beef to the bottom end. This is especially useful if your are producing house, techno or jungle, in which case the definition of the bass and treble can be of paramount importance.

At the very least, the Sound Enhancer is a neat replacement for a full multi-band graphic equaliser. Once you've used one for a day you won't want ever to be without it!

Little Gem Micro Mixer
Emerald Creative £66.95

Another little problem with the Amiga's output is that when four channels of mono samples are played there is no way of adjusting the stereo pan position

of each (although SoundStudio and other multi-channel trackers now offer panning). Two channels are fed through the left output and two through the right. The Little Gem Micro Mixer is a two channel mixer that offers independant pan controls for each channel, allowing you to mix both sides to the centre or anywhere else in the stereo field.

On top of this, there are independant volume, bass and treble controls for each channel. The ability to EQ and pan the channels goes a long way to curing two of the biggest problems you'll face when making a master recording of an Amiga sample-based song. It will also prove useful in small MIDI setups where there is a shortage of controls or channels on the main mixer.

One Stop Music Shop
£150-£200 second hand

A few years ago Blue Ribbon released this unique Zorro sound card. Unlike the Zorro sampler cards covered earlier in this chapter, the One Stop Music Shop is really the internal workings of a Proteus multitimbral synthesiser. Conforming to the General MIDI standard it has all the sounds that are specified by GM along with some of its own. Using samples of real instruments as a base for its sounds, it enhances these with its own synthesiser processes.

Anyone looking for a neat multitimbral sound module with a variety of synthesised, orchestral and drum sounds will be satisfied. The One Stop Music Shop can be used with any sequencer running on the same Amiga (or externally) with the use of its 'MIDI Loop-back' mode. This allows your sequencer to talk to the card through a MIDI interface and a MIDI cable, so there is no need for specific support from your chosen sequencer.

chapter 7

MIDI and recording extras

Once you venture outside the realms of the basic Amiga tracker and into the world of MIDI and multi-track recording your options are opened right up. An almost limitless number of MIDI instruments can be connected to and controlled from your Amiga. Once you start adding MIDI instruments you'll need to get yourself a mixer to combine the different sound sources, and while you're making your musical shopping list, how about adding a few effects modules too? The best thing about building your own MIDI system is that you can tailor it to your specific requirements, adding only what you really need (and what you can afford). All of the gear covered in this chapter can also be used with MIDI sequencing systems other than the current range of Amiga computers, so even if you eventually upgrade or replace your current computer, your external equipment will not be redundant.

MIDI

MIDI (Musical Instrument Digital Interface) is the communication standard used by electronic musical instruments. The Amiga has never been factory fitted with MIDI ports but this is not a problem as a MIDI interface is a cheap addition to any system, starting from around £15. A MIDI interface plugs into your Amiga's serial port and adds Din sockets for MIDI In and MIDI Out connections.

The better interfaces will have more than one MIDI Out connection. Even if you only have one piece of MIDI equipment when you buy the interface, it's still worth getting an interface with more than one Out connection in case you add more units later. It is quite possible to control more than one MIDI instrument simultaneously with just one MIDI Out by hooking them together in a 'daisy chain' sequence. However, if you add too many units in this way you may experience delayed reactions from those at the end of the chain. Giving each unit a direct feed from the interface will avoid this.

MIDI cables carry information on 16 independent channels, in effect allowing you to play up to 16 voices at once from any combination of your MIDI instruments. This limit can be exceeded with special MIDI interfaces such as Triple Play Plus (which sports three sets of 16 channels).

So what constitutes a MIDI instrument? Technically it's anything that can send or receive MIDI data. Typical examples include controller keyboards, synthesiser keyboards, synthesiser modules and drum machines. Various other bits and pieces can also be controlled via MIDI, including many effects processors, some mixing desks and even lighting rigs for stage shows. Most MIDI instruments have no built in speakers as they are designed to be routed through an optional mixer to

an amplifier and speaker system.

Only you can decide exactly what MIDI equipment you'll need to fulfil your particular musical aspirations. However, some pointers are always handy, and to this end here are a few recommendations for anyone just starting out with a limited budget.

MIDI controller keyboard

MIDI controller keyboards look like synthesisers but make no sound of their own. The purpose of a controller keyboard is to transmit MIDI information to another unit, which would typically be a MIDI module or a sequencer.

The most basic controller keyboard would respond to and transmit little more than 'note on' and 'note off' information. In other words, which keys are pressed and for how long. However, most will respond to and transmit other information, such as velocity (the force with which the keys are hit) and modulation data. Modulation is normally controlled by a wheel protruding from the left hand side of the keyboard and can be assigned to a particular aspect of the current sound. For example, if modulation was assigned to the sound's filter, moving the modulation wheel would have the effect of opening and closing the filter. A controller keyboard is only necessary if you have no other method of playing your MIDI instruments, or your current MIDI keyboard is defective or restricted in features or size.

Synthesiser keyboard

One of the best ways to expand your Amiga to a MIDI system is with a synthesiser keyboard. This will act as a sound source and a controller keyboard. If this is to be your first purchase it's best to go for a multitimbral keyboard. This will come with

a range of different sounds and will be able to play a number of them at the same time when used with your sequencer.

Most entry-level synth keyboards conform to the General MIDI (GM) standard. By definition, all GM instruments have the same set of sounds stored in the same locations. For example, sound number one of any GM instrument is a piano. The set of GM sounds attempts to cover the range of 'bread and butter' sounds that would be used in the production of a wide range of musical styles, including dance, rock, pop, orchestral and more. As you can imaging, one set of GM sounds is much like another (that's the whole point) which means that you are unlikely to find much individuality in a low cost GM instrument.

However, there is nothing to stop a GM instrument having its own sounds and synthesis methods in addition to these, and there is also nothing to say that a keyboard synthesiser must comply to GM. You'll find most entry-level keyboard synths will have all the basic sounds you need to make a complete song, including drum sounds.

MIDI module

A MIDI module is a MIDI instrument that has no keyboard and can only be played or controlled by an external sequencer or other MIDI device. Like the previously discussed keyboard synths, MIDI modules are often multitimbral and GM compatible. Many synthesisers are also available in MIDI module format and are cheaper in comparison as you are not paying for the keyboard.

MIDI modules are handy for expanding a MIDI system when there is already a suitable controller keyboard in the setup. If you were to use OctaMED or SoundStudio it would be quite possible to connect straight up to the module with no need for a

MIDI keyboard, as those programs allow you to play the instruments (albeit rather crudely) from the Amiga keyboard. Most other sequencers do not have this function.

Drum machines

It's often a good idea to add a drum machine to handle your rhythm sections. Although many synths and modules come with drum sounds, sometimes they can be token inclusions and not really offer the kind of sound you want. Most drum machines come with pads which can be made to act like different drums (one for the bass drum, one for the snare) so that you can beat out a rhythm in real time. Many are also equipped with their own sequencer which can be handy for testing out ideas even if you do have a sequencer running on your Amiga.

The only safe way to choose a drum machine is to try it out for yourself. Most modern models do a fair job of trying to please everyone. If you want to create an authentic live sounding rock back beat you will need to use a drum machine with sampled drum sounds which is the standard for most you'll find. However, if you're after bass drums that shake the rafters and all those weird sounds that crop up so often in electronic and dance music, an analogue machine is best for the job. Roland's TR808 and TR909 drum machines are responsible for these sounds, and although they have been out of production for some years, many current digital drum machines have samples of their sounds. Some manage to capture the feel, others fail.

Whatever you're after, make sure you get to have a good thrash around with any you are interested in before parting with your cash.

MIDI samplers

If you're hooked on sampling but are not satisfied with what the Amiga can offer, take a look at some MIDI samplers. Most come in the form of a MIDI module, although there are keyboard versions available. However, unlike modules, samplers have no internal sounds. Before you can get anything from a sampler you first have to either load in a sample from disk (or via SCSI or MIDI dump) or record a sound yourself.

The process of recording and editing on most MIDI samplers is a far cry from the on-screen graphical approach of Amiga sampling. This can be solved if you can find a way of transferring samples to your Amiga for editing, and then back to the sampler for playback. The advantage of a MIDI sampler is that you will normally get 16-bit resolution and higher sample rates, so the overall sound quality will be excellent. Akai, Roland and Emu all produce a range of samplers, while the best entry level options are the Akai SO1 and the now discontinued units from Cheetah.

Mixers

The essential function of a mixer is to combine a number of sounds from different sources into a single stereo signal. Mixers will also allow you to alter the stereo pan position, relative volume and tonal content (EQ) of the different sounds. A mixer is essential if your music system is made up of more than one instrument.

If you have a modest MIDI setup there's no need to splash out thousands of pounds on a professional studio mixing desk. You can buy a brand new mixer with plenty of features for a home studio for as little as £199 – specifically, the Samson Mix Pad 9 from Sound Technology. This offers three mono and three stereo line inputs (the mono inputs can be switched

to mic), with treble, bass and pan controls for each channel. Two auxiliary loops allow you to connect effects units and there's also balanced input and outputs.

Good quality entry-level mixers are also available from Spirit (via Sound Technology) and Mackie. Give them a call for details.

Effects processors

If your music is still sounding rather subdued and lifeless it's probably time to call in the help of an effects processor. Effects processors take an incoming sound and pass it through either analogue circuitry or digital algorithms to simulate effects such as echoes, reverb, distortion and so on. The affected sound is passed to the output. Vocals are nearly always recorded with reverb and various other effects, sometimes to gloss over imperfections in the voice.

An effects processor is not absolutely essential for producing professional quality music, but it will certainly help. The fact that you can apply many common effects directly to Amiga samples means that you can fool the listener into thinking you have a bigger system than you actually have.

If you like to experiment and are on a tight budget it's worth taking a look at guitar effects pedals. These will work with any line level signal, not just guitars, and can be useful for adding a grungy warmth to sounds.

Recording

Recording straight to cassette tape is fine for demos but you'll need better quality for making master recordings. The DAT is now used by many MIDI musicians as a mastering medium (rather than the traditional multi-track reel-to-reel tape). DAT tapes (and some recorders) are easily portable and offer

CD quality recording.

A cheaper option is to use DCC. This is a digital cassette tape but unlike DAT, the sound quality is not quite up to CD standard due to the compression system used by the recording and playback hardware. MiniDisc is on a par with DCC when it comes to recording quality. MiniDisc is like a tiny CD in a floppy disk-style case. However, this is a more expensive option than DCC.

Finally there's hard disk recording, for which you could use your Amiga. This is covered in chapter two in the Digital Mastering section.

Glossary

The following glossary of terms covers most references used in this book to music on the Amiga, on any other computer and those in general use in the music industry.

Aux

Short for auxiliary, meaning extra. Hi fis and amplifiers often have an auxiliary input which will be calibrated for a line level audio signal. Aux is often used to label an input channel of a device that can be used for any line level signal.

Balanced (XLR)

Balanced audio connections are used for microphones and other signals where unwanted noise is likely to distort the signal. Two copies of the same signal are sent through the connection, one the mirror image of the other. These are then compared and any noise that has appeared on either signal is thus cancelled out.

BPM

Acronym: Beats Per Minute. BPM is used to specify the speed of the rhythm of a piece of music.

Breakbeat

A sampled bar or two of live drumming, often used as an instant rhythm backing track for dance records. The backbone of all jungle records, normally cut up and processed to extremes in this case.

Channel

Mixing desks have a channel for each audio input. More channels allow for mixing of more sounds. MIDI information also transmits data on its own 'channels' which are completely unconnected with mixer channels.

DAT

Acronym: Digital Audio Tape. DAT is in many areas the standard form for a master recording of a piece of music. DAT stores sound by sampling it and writing the digital sample information onto magnetic tape. The mechanics of a DAT recorder are based upon VHS video mechanisms with the addition of analogue to digital and digital to analogue converters. A DAT cassette is smaller than a box of matches and so ideal for mobile recording.

DCC

Acronym: Digital Compact Cassette. Like DAT, DCC records sound onto magnetic tape as digital information. The resulting recordings are far superior to those on conventional analogue cassette tape but not as high fidelity as those attained by DAT. This is because DCC uses a technique to get more information on less tape by guessing which frequencies of the sound it can

leave out without significantly reducing the perceived fidelity. DCC player machines can also play analogue cassette tapes but special DCC tapes are required for digital recordings.

dB

Decibels. Audio equipment measures the volume of a sound (strength of the signal) in decibels, often abbreviated to 'dB'. Zero dB is equal to 1 volt.

Effects Processing

The enhancement or alteration of a sound. The most common use is the addition of echoes and reverb which lends a feeling of greater 'space' to a sound. This can be carried out in realtime with an effects unit or applied to sample sounds from within sample editing software.

EQ

Short for equalisation. The term describes the relative levels of various frequencies in a sound. To 'EQ' a sound is to alter the relative balance of its component frequencies (such as increasing the bass and decreasing the treble content for example).

Fader

A slider control as found on mixing desks. Faders usually alter the relative volume of a specific track.

Fidelity

Used to describe the level of reproduction of an original sound. A high fidelity (hi-fi) reproduction will sound almost or just as good as the original.

Filter

A component of a mixer or synthesiser which removes specified frequencies of a sound as it passes through. Analogue resonant filters are the key factor in the creation of most 'acid' sounds.

General MIDI

An extension to the MIDI standard which states that an instrument must have certain sounds stored in specific locations to allow a sequence recorded on one GM instrument to replay just the same on another GM instrument.

Hard Disk Recorder

A system which records an audio signal (or a number of audio signals) onto a hard disk in the form of digital data. Computer-based hard disk recorders are most flexible but stand-alone hard disk recorder units are also available, some combined into mixer-style cases.

Hz/KHz

Hertz/Kilohertz. Literally, 'times per second'/'thousand times per second'. This is used to specify the record and replay rate of a sample. For example, a 48KHz sample consists of 48,000 'sample slices' for every one second of its duration.

Jack

Jack plugs are used to connect musical instruments, headphones and microphones to other audio equipment and come in two common sizes: 3.5mm and 6.5mm. Both are available in stereo and mono versions.

Line

Audio signals are generally transmitted at one of two levels: line and mic. Line level signals are used by keyboards, guitars and most electric musical instruments.

Master Recording

The final recording of a piece of music from which duplicates are made on cassette, CD, vinyl or other media. It is vital that the quality of a master recording is as good as possible, especially to counter the unavoidable loss of fidelity if it is to be duplicated onto analogue media such as cassette tape or vinyl.

Mic

Short for microphone. Mic signals use a lower level to transmit than line signals. See 'Line'.

MIDI

Acronym: Musical Instrument Digital Interface. This is the communication standard used by electronic musical instruments and computers in musical applications.

Mixer

A device used to combine two or more sounds from different sources into a single signal, normally used to combine a number of instruments into one stereo signal.

Module

1. Amiga module: Amiga modules are the files created by tracker programs.
2. MIDI module: MIDI modules are instruments that respond to and transmit MIDI data but have no keyboard and must be played via a sequencer or a MIDI controller of some sort.

Mono

A mono sound is just a single signal, as opposed to a stereo sound with is two (normally slightly different) signals. When used to to describe a synthesiser (monosynth for example) the mono prefix refers to the synthesiser's inability to play more than one note at a time, as opposed to a polyphonic synth which can play more than one note at a time, thus enabling the playing of chords.

Notation

The traditional form of recording music on paper. Most sequencers have some form of notation display to complement the sequencer's native Piano Roll method of visualising music.

Noise

Any unwanted frequencies within a sound. The most common incarnations of noise are hiss and hum.

Nyquist Rate

A rule of thumb that says if you want to sample a sound and capture the entire frequency range of that sound, the sample rate must be twice the highest frequency present in the original sound.

Pan
The term used to describe the position of a sound within a stereo field. For example, a sound that was predominantly emitted from the left speaker would be panned to the left.

Parallel Port
One of the Amiga's most useful interfaces is the parallel port, which offers relatively swift interchange of data between the Amiga and external devices. Because of this the parallel port is used by most Amiga samplers due to their demand for very fast rates of data transfer.

Paula
The chip in the Amiga which deals with audio output among other tasks.

Phono/RCA
Phono or RCA connections are commonly used to connect CD players and other hi-fi components to an amplifier. The Amiga's audio output is channelled through a pair of phono sockets.

Piano Roll
The method used by sequencers to display pieces of music on screen. A piano roll display is a horizontally scrolling sequence of notes, in which the pitch of each note is represented by a bar, its pitch described by its vertical position on the roll and its duration described by the length of the bar. Some piano roll displays also show the velocity or volume of each note with an additional vertical bar for each note.

PCMCIA
Acronym: Pulse Coded Modulation Complex Interface Adaptor (or Personal Computer Memory Card International Association depending on who you believe). The Amiga 1200 and 600 are both fitted with a PCMCIA interface. This is found in the slot on the left hand edge of those Amigas and with the absence of Zorro slots, this offers the highest rate of data transfer for external peripherals. Due to this, PCMCIA is used by some samplers and video digitisers.

Quantisation
In the context of a MIDI sequencer, in the simplest form, quantisation allows you to correct mistimed notes from realtime recordings. Quantisation occurs when a sequencer records MIDI data by checking the incoming signal a great number of times every second. If this rate is too slow, quantisation will be apparent during playback, as the timing of each note will have been approximated to a noticeable degree.

Reverb
See Effects Processing.

Ripper
Sample rippers and module rippers are utilities which can extract sound samples or music modules from memory. When the Amiga is reset, often sound data will still be present in RAM after re-booting.

Sampling
Sampling is the process of converting an analogue sound wave into digital information. The position of the wave is 'sampled' thousands of times each second to build a digital picture of the wave. The resultant data is known as a sample and the software/hardware that records it is the sampler.

Sequencer
Generally software used to record and replay music from MIDI instruments. Hardware sequencers do exist but are far more basic and harder to use than computer-based software sequencers.

Stereo
Stereo sounds are made up of two separate sounds, one fed to the 'right' speaker or channel and the other fed to the 'left'.

Synthesiser
A device that creates sound waves by one of number of means. Some use samples as their base and then alter the sound by passing it through modulates and resonant filters, while others begin with the simplest of waves and enhance them to produce far more complex sounds.

Sync
Short for synchronisation.

SysEx
System Exclusive. A type of message sent and received via MIDI giving the user control over a variety of specific parameters.

Tempo
The speed of the rhythm. Tempo is generally specified in BPM (See BPM).

Track
Used to describe the area occupied by a single part of a MIDI or audio recording, such as a bassline or drum pattern. Track is also used as a term to describe an entire piece of music, usually one devoid of vocal parts.

Tracker
A type o sequencer program primarily designed for making music with the Amiga's internal sample-replay features. Trackers are geared towards the more technologically-minded musician.

Velocity
The strength of a note. Velocity sensitive keyboards and drum pads are able to record the amount of pressure that is exerted as a key or pad is hit and can adjust the resulting sound accordingly. For example, pressing a piano key softly gives a different sound to a hard stab on the key and a velocity sensitive keyboard would reflect this. Synthesisers often link velocity to a specific parameter of the sound, such as the filter frequency, in which case a harder press of a key would normally open the filter more.

VU Meter
A component of a mixer or other device which displays the strength of a signal (volume of a sound). VU meters normally take the form of a speedometer style quarter-circular display with signal strength measured in dB.

White Noise

A sound made up of random frequencies. White noise often sounds like wind. Many old analogue synthesisers use white noise as a basis for synthesised drum sounds.

Zorro

Amigas made as a two part system (keyboard and separate box of components) are equipped with Zorro slots for the addition of expansions. Zorro is a connection and communication standard which allows fast and direct interchange between the circuits on the expansion card and the Amiga's RAM. There are three variants of the Zorro 'standard'. Zorro 2 is the most commonly used although this has been superseded by Zorro 3 which offers superior performance. If you have an A500/600 or A1200 various tower systems are available that would give you Zorro slots: but at a cost.

Contacts

Akai UK

Haslemere Heathrow Estate
The Parkway
Hounslow
Middlesex
TW4 6NQ
Tel: 0181 897 63880

Control Synthesis

Chapel Mews
Crewe Road
Alsager
Stoke on Trent
Staffs ST7 2HA
Tel: 0270 8837790

HiSoft

The Old School
Greenfield
Bedfordshire
MK45 5DE
tel: 01525 718181
fax: 01525 713 7160

Maurizio Ciccione

Via Neghelli 9
Alassio (SV) 17021
Italy
fidonet: 2:332:206.70

New Dimensions

Gordon Wheatman.Brooklands House
Bryngwyn
Raglan
Gwent
NP5 2AA
Tel: 01291 690 9330

Power Computing

44 A/B Stanley Street
Bedford
MK41 7RW
Tel: 01234 273000
Fax: 01234 352207

RBF Software
169 Dale Valley Road
Hollybrook
Southampton
SO1 6QX
Tel/Fax: 0703 785680
email: rbfsoft@cix.compulink.co.uk

Roland UK
Roland UK
Rye Close, Ancells Business Park
Fleet
Hampshire
GU13 8UY
Tel: 01792 702701
fax: 01792 3102480

Synthology
114-116 Charing Cross Road
London
WC2H ODT
Tel: 0171 722 14200

Tascam/Teac UK
5 Marlin House
The Croxley Centre
Watford
WD1 8YA
Tel: 0923 819630
Fax: 0923 2362900

Time+Space
Ed Stratton
PO Box 306
Berkhamstead
Herts
HP4 3EP
Tel: 01442 870681
Fax: 01442 877266

White Knight Technology
PO Box 38
Ware
Herts
SG11 1TX

Yamaha Kemble Music
Sherbourne Drive
Tilbrook
Milton Keynes
MK7 8BLY
Tel: 01908 366700
Fax: 01908 368 8720

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